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APPENDIX V

SOILS, EROSION AND SEDIMENTATION SEVIER RIVER BASIN, UTAH



UNITED STATES DEPARTMENT OF AGRICULTURE

Economic Research Service Forest Service Soil Conservation Service

May, 1971

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APPENDIX V
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SEVIER RIVER BASIN, UTAH

United States Department of Agriculture
Economic Research Service
Forest Service
Soil Conservation Service
Salt Lake City, Utah

May, 1971

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Chapter I

I N T R O D U C T I O N

Mapping of the Soil Associations was conducted in two phases: (1) The survey of private, State, National Park and Public Domain lands was performed by personnel of the Soil Conservation Service, and (2) survey of National Forest lands was performed by personnel of the Forest Service.

The mapping unit descriptions of National Forest lands described in Chapter II, Part I are the results of a reconnaissance soil survey by Forest Service personnel. Mapping units are composed of one or more soils that comprise a soil association and may contain undifferentiated soil units and miscellaneous land types. The generalized descriptions include principal location, landform(s), elevation, slope, average annual precipitation, parent material, geology, erosion, and vegetation. The percentage of coarse fraction is encompassed within the profile description where applicable. Miscellaneous land types, where the above data is not applicable, are briefly described. On National Forest lands, the mapping units are numbered from 1 to 157.

The soil associations mapped by the Soil Conservation Service and described in Part II delineate broad landscapes with similarity of slopes and soils. Observations of soils, erosion and vegetation were made by driving over the areas and using existing surveys and personal knowledge of the area. Use was made of road cuts, excavations, soil auger and spade. Soils were described within these broad landscapes by percentage of each soil at the Great Soil Group level using the 1938 Yearbook of Agriculture as the basis for classification. The descriptions define drainage, depth, texture, coarse fragments, lime, and horizons. In addition, physiography, slope, elevation, water-holding capacity, erosion, precipitation, vegetation, cropland and range site capability class and subclass were described. These associations are numbered 201 through 255.

Soil associations that cross National Forest boundaries were correlated between the two surveys. These are described in the appropriate portion of the report depending on which survey was used to delineate the area.

All mapping was done on Army Map Service high altitude flight aerial photos with an approximate scale of one inch equals one mile except for that area in Sanpete Valley north of Sterling. This

area was mapped on Utah General Highway Maps at a scale of one-half inch equals one mile.

In July 1968, the original descriptions were revised to correspond to the present Soil Conservation Service classification system (7th Approximation) at the Great Group or Sub-group level using the March 1967 soil key with amendments through July 1968. Also, the original soil association descriptions prepared by the Forest Service were generalized and condensed and the technical profile descriptions eliminated.

The key map following the soil association descriptions shows the location within the Basin of the individual soil association maps. The key map numbers refer to the numbers found in the lower right corner of the individual maps.

Extensive field work to gather data for erosion and sedimentation was limited to the detailed resurveys of Otter Creek, Piute and Sevier Bridge Reservoirs. The irrigation companies involved and the State of Utah participated financially to pay for the aerial photography. The irrigation companies also furnished survey crew assistance.

The Soil Conservation Service was responsible for the field surveys, preparation of the topographic maps and evaluation of the sediment data. The final maps with appropriate area-capacity tables were accepted by the irrigation companies and the courts. They are now the official documents for these reservoirs.

Chapter II

S O I L A S S O C I A T I O N S

GLOSSARY OF TERMS

Bleached - Light colored, Albic or A2 horizon (gray coatings on peds).

Dark colored - Colors dark enough to qualify for a mollic epipedon.

Light colored - Colors not dark enough to qualify for a mollic epipedon.

Lime accumulations - Sufficient to qualify for calcic horizon.

Surface layer - Topsoil or A1 horizon.

Subsurface layer - Layer immediately underlying the surface layer but more like the surface than subsoil. (Generally A2 horizons).

Subsoil - The B horizon or about 10 to 36 inch control section.

Substratum - C horizon below the B horizon, or below the control section.

Thin - Layer not thick enough to qualify for a mollic epipedon even though the colors may qualify. Generally less than 7 inches thick.

Very gravelly - More than 50 percent coarse fragments, mainly gravel.

Very cobbly - More than 50 percent coarse fragments, mainly cobble.

Very stony - More than 50 percent coarse fragments, mainly stone size.

For soil names see Soil Classification, 7th Approximation, revised to 1968.^a

For other definitions see the Soil Survey Manual or Webster's Dictionary.

^aSoil Classification is tentative and based on meager data in many cases.

Chapter II

SOIL ASSOCIATION DESCRIPTIONS

Association 1

This association consists of about 50 percent Ustochrepts, 25 percent Ustifluvents, 15 percent Lithic Haploborolls and 10 percent Cryochrepts.

Ustochrepts have loam and clay loam, light colored surface layers and clay subsoils with 10 to 70 percent coarse fragments, over a cemented pan at less than 2 feet.

Ustifluvents are deep, mostly stratified, and have silt loam surface layers and silty clay or clay subsoils.

Lithic Haploborolls have very stony loam, dark colored surface layers and gravelly loam subsoils that have a strong lime accumulation. They are underlain by bedrock at depths of less than 20 inches.

Cryochrepts have loam, light colored surface layers and cobbly clay subsoils over bedrock at about 3 feet.

These soils are forming in alluvium, colluvium and residuum derived from limestone and some volcanic rocks. They occur at elevations of 7,200 to 8,600 feet in the Northeast fringe of the Markagunt Plateau. Topography consists of scarps, knolls, alluvial fans, colluvial slopes and flood plains. Ustochrepts and Lithic Haploborolls are on scarps and knolls; Ustifluvents are on flood plains and alluvial fans; and Cryochrepts are on the colluvial slopes. Slopes range from 2 to 50 percent with 20 to 50 percent most common. Precipitation is about 17 inches. Erosion is slight. Native vegetation is pinyon-juniper, ponderosa pine, big sagebrush, manzanita, bitterbrush, wheat-grasses, grama and fescues.

Association 2

Unit 2 consists of the most recent lava flows in the Sevier River Basin. These flows are in large patches between 7,700 and 9,700 feet. The flows are too recent for soil development or invasion by higher plants. These scoriaceous flows have very high water percolation rates. Surface runoff is negligible.

Association 3

This association consists of Aquic Haploborolls. They have fine sandy loam and silt loam, dark colored surface layers and silty clay

loam and silty clay subsoils. They have mottles at depths below 2 feet. These soils are forming in alluvium derived from limestone. They occur at elevations of about 7,500 feet along Mammoth and Asay Creeks and at the west end of Panguitch Lake. Topography consists of flood plains and stream bottoms. Slopes range from 1 to 5 percent. Precipitation ranges from 18 to 22 inches. Erosion is slight. Native vegetation is sagebrush, rabbitbrush, and sod-forming grasses, sedges and rushes.

Association 4

This association consists of Argic Cryoborolls. They have gravelly sandy loam, dark colored surface layers and gravelly light clay loam subsoils over gravelly sandy loam substrata. These soils are forming in alluvium and water-worked materials derived from limestone and volcanic rocks. They occur at elevations of 7,600 to 8,300 feet in the area between Hatch and Panguitch Lake. Topography consists of dissected terraces. Slopes range from 1 to 15 percent. Precipitation is about 16 inches. Native vegetation is juniper-pinyon forest with a broken ground cover of Indian ricegrass, blue grama and squirreltail.

Association 5

This association consists of about 90 percent Lithic Argiborolls and 10 percent Lithic Haploborolls. Lithic Argiborolls generally have gravelly loam and gravelly sandy clay loam, dark colored surface layers and cobbly clay subsoils over bedrock at less than 20 inches. About 30 percent have silty clay loam and clay loam, dark colored surface layers and cobbly clay subsoils over bedrock at less than 20 inches. Lithic Haploborolls have stony loam dark colored surface layers and gravelly sandy clay loam subsoils over bedrock at less than 20 inches. These soils are forming in residuum derived from andesite and basalt with some limestone. They occur at elevations of 7,200 to 8,000 feet in the area east of Panguitch Lake. Topography consists of ridges and mesas. Slopes range from less than 5 to 45 percent on all exposures. Precipitation is about 17 inches. Erosion is slight. Native vegetation is pinyon-juniper to ponderosa pine forests with mountain-mahogany, big sagebrush, ceanothus, bitterbrush, and other species.

Association 6

This association consists of about 60 percent Ustochrepts and 40 percent Argiborolls. Ustochrepts have loam, light colored surface layers and clay loam subsoils over tightly packed andestic gravel and cobble. Argiborolls have loam, dark colored surface layers and gravelly clay subsoils. These soils are forming in residuum derived from andesites. They occur at elevations of 7,800 to 8,800 feet

between the base of Horse Valley Mountains northwest on Panguitch Lake and Panguitch Creek. Topography consists of long, channeled, subdued ridges. Slopes range from 10 to 30 percent in most places, with a general southeast exposure. Precipitation is about 20 inches. Erosion is slight to moderate. Native vegetation is sagebrush-grass type.

Association 7

This association consists of Cryoboralfs. About 65 percent of the soils have thin loam, light colored surface layers and loam to gravelly loam subsoils overlying strong lime accumulations below about 12 inches. About 20 percent of the soils have sandy loam, bleached surface layers and clay subsoils over limestone bedrock at about 2 feet. About 10 percent of the soils have loam, dark colored surface layers and clay loam subsoils over stratified very cobbly light clay loam and clay substrata. About 5 percent of the soils have thin, gravelly, light loam surface layers and thin, gravelly clay loam subsoils over very gravelly loam substrata at about 16 inches. These soils are forming in residuum and colluvium derived from limestone, shale and sandy limestone. They occur at elevations of 8,300 to 9,600 feet on the south end of the Paunsaugunt Plateau and the southwestern edge of the Markagunt Plateau. Topography consists of elongated ridges with a series of mesas, colluvial slopes, old mudflow slumps and benches. Slopes range from less than 5 percent on the mesas and benches to 65 percent on the colluvial slopes, but dominantly 30 to 50 percent. Precipitation ranges from 20 to 30 inches. Erosion is slight. Native vegetation is mixed conifer-aspen stands with small areas of nearly pure aspen.

Association 8

This association consists of Cryochrepts. They have heavy silt loam, dark colored surface layers and gravelly heavy silt loam subsoils over a cobbly and stony, weakly cement pan. These soils are forming in material derived from limestone. They occur at elevations of 8,000 to 8,500 feet. Topography consists of a low tilted mesa southeast of Panguitch Lake. Slopes range from 5 to 15 percent with a general southerly exposure. Precipitation is about 18 inches annually. Erosion is slight. Native vegetation is ponderosa pine with Indian ricegrass, gramagrass, squirreltail, mountainmahogany, and bitterbrush.

Association 9

This association consists of about 55 percent Typic Cryoborolls, 35 percent Cryorthents, 5 percent Cryochrepts and 5 percent Cryoboralfs.

Typic Cryoborolls have very gravelly loam, dark colored surface layers and gravelly silt loam subsoils over stones and boulders at about 2 feet.

Cryorthents have gravelly fine sandy loam, light colored surface layers and gravelly loam or very gravelly loam substrata with 80 percent gravel at about 2 feet.

Cryochrepts have very gravelly silt loam, light colored surface layers and very gravelly silt loam subsoils.

Cryoboralfs have loam, thin, dark colored surface layers and loam to gravelly loam subsoils over very gravelly loam substrata.

These soils are forming in colluvium and residuum derived from limestone, shale and conglomerates. They occur at elevations of 7,700 to 8,800 feet in the south end of the Paunsaugunt Plateau and the south edge of the Markagunt Plateau. Topography consists of elongated ridges. Slopes range from 10 to 70 percent but mostly 30 to 60 percent on southerly exposures. Precipitation ranges from 16 to 25 inches annually. Erosion is slight to moderate. Native vegetation is an open stand of ponderosa pine with dense understory stands of manzanita.

Association 10

This association consists of about 65 percent Boralfic Cryoborolls under conifer and 35 percent Argic Cryoborolls under grass meadows.

Boralfic Cryoborolls have gravelly loam, dark colored surface layers, gravelly sandy clay loam, bleached subsurface layers, and clay and gravelly clay subsoils and substrata.

Argic Cryoborolls have loam, dark colored surface layers and clay subsoils.

These soils are forming in residuum and alluvium derived from intermediate volcanic rocks. They occur at elevations of 8,800 to 10,000 feet in the western part of the Markagunt Plateau. Topography consists of braided low ridges and tilted flats. Slopes range from 5 to 20 percent with a general easterly exposure. Precipitation ranges from 34 to 40 inches annually. Erosion is slight. Native vegetation is conifer-aspen stands and grass meadows. Conifers are Engelmann spruce and alpine fir.

Association 11

This association consists of about 85 percent Ustochrepts, 10 percent Lithic Haploborolls and 5 percent Rock outcrops.

Ustochrepts have loam, light colored surface layers and clay loam and gravelly clay loam subsoils.

Lithic Haploborolls have gravelly sandy loam, dark colored surface layers over bedrock at 5 to 20 inches.

Rock outcrops have less than 5 inches of soil material over bedrock.

These soils are forming in residuum and alluvium derived from conglomerates, sandstone and limestone. They occur at elevations of 7,400 to 7,800 feet. Topography consists of ridges between the Sevier River and the Markagunt Plateau in the vicinity of Long Valley Junction. Slopes range from 10 to 70 percent with 30 to 50 percent being most common on all exposures. Precipitation is about 17 inches annually. Erosion is slight to moderate in most places and severe in about 10 percent of the area. Native vegetation is brush such as Gambel oak, mountainmahogany and big sagebrush.

Association 12

This association consists of about 40 percent Argic Cryoborolls, 30 percent Lithic Cryoborolls and 30 percent Cryochrepts.

Argic Cryoborolls have fine gravelly loam and loam, dark colored surface layers and cobbly clay loam or gravelly clay loam subsoils over very gravelly substrata.

Lithic Cryoborolls have sandy loam, dark colored surface layers, and gravelly and cobbly subsoils over bedrock at less than 20 inches.

Cryochrepts have clay loam, light colored surface layers and silty clay loam subsoils.

These soils are forming in colluvium derived from acidic to intermediate volcanic rocks. They occur at elevations of 8,000 to 9,500 feet. Topography consists of a large complex system of ridges at the north end of the Markagunt Plateau. Slopes range from 5 to 70 percent, mostly 20 to 40 percent on all exposures. Precipitation ranges from 16 to 20 inches annually. Erosion is slight. Native vegetation is conifer, aspen, pinyon, juniper, big sagebrush, mountainmahogany and grasses.

Association 13

This association consists of about 80 percent Argic Cryoborolls under grass and 20 percent Boralfic Cryoborolls under conifer.

Argic Cryoborolls have clay loam, dark colored surface layers and clay subsoils.

Boralfic Cryoborolls have gravelly loam, dark colored surface layers, gravelly sandy clay loam, bleached subsurface layers, and clay and gravelly clay subsoils and substrata.

These soils are forming in residuum derived from intermediate and basic extrusive igneous rocks with some limestone. They occur at elevations of 10,000 to 10,500 feet. Topography consists of undulating ridges of low relief near Cedar Breaks National Monument. Slopes range from 5 to 35 percent and are generally east facing exposures. Precipitation ranges from 34 to 40 inches annually. Erosion is slight. Native vegetation is grasses with clumps of conifer.

Association 14

This association consists of about 90 percent Cryoboralfs and 10 percent Alluvial land.

Cryoboralfs have silty clay loam, light colored surface layers and clay subsoils.

Alluvial land has loam surface layers over clay loam or clay subsoils that are gravelly in places.

These soils are forming in alluvium derived from basalt and limestone. They occur at elevations of 9,700 to 9,800 feet in Midway Meadows north of Navajo Lake. Topography consists of flat meadows and surrounding steeper edges. Slopes range from 0 to 10 percent, mostly less than 1 percent. Precipitation ranges from 26 to 30 inches annually. Erosion is slight. Native vegetation is big sagebrush, cana sagebrush and grasses.

Association 15

This association consists of Argic Cryoborolls. About 60 percent of these soils have loam, dark colored surface layers and gravelly clay subsoils. They are under conifer and aspen. About 20 percent have gravelly heavy loam, dark colored surface layers and cobbly clay loam subsoils. They are under a sagebrush-grass vegetative cover. About 20 percent have clay loam surface layers and clay subsoils. These are under cana sagebrush, rabbitbrush, needlegrass, wheatgrass, bluegrass, and brome grass. These soils are forming in alluvium derived from intermediate volcanic rocks. They occur at elevations of 9,000 to 10,500 feet. Topography consists of a system of ridges on the upthrown side of the Black Ledge Fault northwest of Panguitch Lake. Slopes range from 3 percent on the alluvial bottoms to 70 percent on the scarp slopes. Precipitation ranges from 20 to 30 inches annually. Erosion is slight. Native vegetation is spruce-fir on the north slopes and higher elevations to sagebrush and grasses on ridges at lower elevations.

Association 16

This association consists of about 30 percent Lithic Cryoborolls and 70 percent Rubble land.

Lithic Cryoborolls have loam, dark colored surface layers and very gravelly clay loam subsoils over bedrock at less than 20 inches.

Rubble land is composed of large angular basalt boulders. No vegetation has become established on this land.

These soils are forming in residuum derived from basalt. They occur at elevations of 9,600 to 10,000 feet. Topography consists of subdued ridges, sinks and flats in the south central portion of the Markagunt Plateau. Slopes range from 0 to 10 percent with north facing exposures. Precipitation ranges from 22 to 26 inches annually. Erosion is slight. Native vegetation is aspen, Engelmann spruce, alpine fir, Oregon grape and dwarf juniper.

Association 17

This association consists of Argic Cryoborolls. They have loam, dark colored surface layers and gravelly or cobbly clay subsoils over stony loam substrata. These soils are forming in colluvium derived from intermediate volcanic and limestone rocks. They occur at elevations of 10,500 to 11,000 feet. Topography consists of concave slopes and benches on the north side of Brian Head ridge. Slopes range from 20 to 40 percent. Precipitation ranges from 36 to 40 inches annually. Erosion is slight. Native vegetation is bunchgrasses such as bluegrass, needlegrass, and fescue.

Association 18

This association consists of about 85 percent Typic Cryoborolls and 15 percent Rock land.

Typic Cryoborolls have very gravelly clay loam, dark colored surface layers and gravelly heavy loam subsoils over very gravelly sand to very gravelly loamy sand.

Rock land is tightly packed rubble with some soil in the depressions between rocks. Vegetation is a fescue.

These soils are forming in residuum, alluvium and colluvium derived from rhyolite. They occur at elevations of 10,500 to 11,300 feet. Topography consists of a mesa top east of Brian Head Point. Slopes range from 0 to 10 percent with most of it being nearly flat. Precipitation is about 40 inches annually. Erosion is slight. Native vegetation is widely spaced clumps of alpine fir with very little herbaceous ground cover between the clumps.

Association 19

This association consists of about 50 percent Typic Cryoborolls, 30 percent Lithic Cryoborolls and 20 percent Rubble land.

Typic Cryoborolls have loam, dark colored surface layers and heavy loam subsoils over fractured basalt bedrock at 24 inches.

Lithic Cryoborolls have loam, dark colored surface layers over basalt bedrock at less than 20 inches.

Rubble land is composed of large angular basalt boulders.

These soils are forming in residuum derived from basalt. They occur at elevations of 8,300 to 8,800 feet. Topography consists of a lava flow in the central part of the Markagunt Plateau. Slopes range from 0 to 10 percent. Annual precipitation is about 24 inches annually. Erosion is slight. Native vegetation is ponderosa pine and aspen.

Association 20

This association consists of Typic Cryoborolls. They have sandy loam, dark colored surface layers and cobbly sandy clay loam subsoils over drift-like cobble at 2 to 5 feet. These soils are forming in colluvium and alluvium derived from intermediate volcanic rocks. They occur at elevations of 7,700 to 8,700 feet. Topography consists of a long, concave colluvial slope on the east side of Bear Valley Mountains. Slopes range from 5 to 20 percent with a southeast exposure. Precipitation is about 16 inches annually. Erosion is slight. Native vegetation is sagebrush and grass.

Association 21

This association consists of Ustochrepts. They have cobbly loam, light colored surface layers and gravelly clay loam subsoils with about 50 percent gravel. These soils are forming in colluvium derived from intermediate volcanic rocks. They occur at elevations of 7,400 to 8,200 feet. Topography consists of a broad ridge at the south end of Bear Valley on convex slopes. Slopes range from 20 to 60 percent with 30 to 50 being most common. Precipitation ranges from 14 to 18 inches annually. Erosion is slight. Native vegetation is sagebrush, juniper, rabbitbrush, bitterbrush and Oregon grape.

Association 22

This association consists of Argiborolls. They have loam, dark colored surface layers and heavy clay loam subsoils. These soils are forming in alluvium derived from intermediate volcanic rocks. They

occur at elevations of 7,100 to 7,800 feet. Topography consists of a graben north of the Markagunt Plateau. Slopes range from 5 to 20 percent. Precipitation ranges from 14 to 18 inches annually. Erosion is slight. Native vegetation is sagebrush and grass that has been seeded to grasses in most places.

Association 23

This association consists of Cryochrepts. They have stony, thin sandy loam, light colored surface layers, cobbly sandy loam bleached subsurface layers, and gravelly sandy clay loam subsoils. These soils are forming in glacial till, alluvium and colluvium derived from intermediate to acidic volcanic rocks. They occur at elevations of 9,800 to 10,400 feet in Sydney Valley. Topography consists of an area of faulting and mass-wasting. Slopes range from 1 to 15 percent. Precipitation is about 23 inches annually. Erosion is slight. Native vegetation is meadow grass and forest. The forest consists of alpine fir and Engelmann spruce.

Association 24

This association consists of about 60 percent Typic Cryoborolls and 40 percent Cryorthents.

Typic Cryoborolls have loam and gravelly loam, dark colored surface layers and clay loam subsoils.

Cryorthents have loam and stony loam, light colored surface layers and cobbly loam subsoils.

These soils are forming in residuum derived from basalt. They occur at elevations of 8,500 to 10,600 feet in the south, central part of the Markagunt Plateau. Topography consists of elevated volcanic flows. Slopes range from 1 to 40 percent. Precipitation ranges from 20 to 26 inches annually. Erosion is slight. Native vegetation is conifer, aspen and meadow grasses. The conifer trees are mainly ponderosa pine, Engelmann spruce and alpine fir.

Association 26

This association consists of about 35 percent Ustochrepts, 25 percent Haplaquepts, 15 percent Haploboralfs, 10 percent Haplaquolls, 10 percent Aquic Haploborolls and 5 percent Argiborolls.

Ustochrepts are well drained, have silt loam, dark colored surface layers and thin light silty clay loam subsoils over stratified silty clay loam, silt loam and loamy sand substrata.

Haplaquepts are somewhat poorly drained, have silt loam, light colored surface layers and silty clay subsoils over stratified silt loam and clay loam substrata, and mottled at about 20 inches.

Haploboralfs are well drained, have silt loam, light colored surface layers and silty clay loam subsoils.

Haplaquolls are poorly drained, have fine sandy loam, dark colored surface layers and heavy loam to fine sandy loam subsoils with mottles at about 21 inches.

Aquic Haploborolls are somewhat poorly to moderately well drained, have silt loam to very fine sandy loam, dark colored surface layers and stratified silt loam, loam, very fine sandy loam and clay loam subsoils that are mottled between 8 and 25 inches from the surface.

Argiborolls are moderately well drained, have very fine sandy loam, dark colored surface layers and clay loam to heavy loam subsoils. These soils are forming in mixed alluvium derived from sandstone, limestone and shale. They occur at elevations of 7,500 to 8,200 feet. Topography consists of drainage ways on the south end of the Paunsaugunt Plateau and the southwestern edge of the Markagunt Plateau. Slopes range from 0 to 10 percent and typically about 2 percent. Precipitation ranges from 16 to 25 inches annually. Erosion is slight. Native vegetation is meadow grasses and willows in wet areas and brush on well drained areas.

Association 31

This association consists of 80 percent Cryochrepts under conifer and 20 percent Cryoborolls under aspen.

Cryochrepts have clay loam, light colored surface layers and clay subsoils over decomposing sandstone.

Cryoborolls have loam, dark colored surface layers and clay subsoils over decomposing sandstone.

These soils are forming in residuum derived from sandstone and limestone. They occur at elevations of 8,700 to 9,000 feet. Topography consists of scarp slopes and rounded ridgetops adjacent to the cliffs that form the western perimeter of the Paunsaugunt Plateau. Slopes range from 10 to 70 percent but are mainly 40 to 60 percent. Precipitation is about 20 inches annually. Erosion is slight. Native vegetation is conifer such as Douglas fir, ponderosa pine, aspen, sagebrush, mountainmahogany, Oregon grape, phlox, mountain myrtle.

Association 32

This association consists of about 35 percent Haploborolls, 20 percent Lithic Cryoboralfs, 20 percent Cryoboralfs, 15 percent Lithic Cryorthents, 5 percent Cryaquepts, and 5 percent Rock outcrops.

Haploborolls have fine sandy loam or sandy loam, dark colored surface layers, loam to fine sandy loam subsoils and silty clay or silty clay loam substrata. Coarse fragments amount to about 10 percent.

Lithic Cryoboralfs have sandy loam, dark colored surface layers with bright chromas, and loam subsoils over bedrock at less than 20 inches.

Cryoboralfs have loamy sand to sandy loam, light colored surface layers and sandy clay loam subsoils over sandstone bedrock at 20 to 40 inches. Coarse fragments make up 50 to 70 percent.

Lithic Cryorthents have loamy sand, light colored surface layers and sandy loam subsoils over bedrock at less than 20 inches. Coarse fragments make up less than 10 percent of the volume.

Cryaquepts are poorly drained, have sandy loam, thin, dark colored surface layers, stratified sandy loam and silt loam mottled subsoils over bedrock at about 40 inches. Coarse fragments make up less than 20 percent of the volume.

Rock outcrops consist of exposed shale and sandstone with a sparse cover of mountainmahogany, pinyon pine, and juniper.

These soils are forming in colluvium, residuum and alluvium derived from interbedded siltstone, sandstone and shale. They occur at elevations of 7,500 to 8,500 feet, below the rim of the Paunsaugunt Plateau in the main drainage system of the East Fork and in the Johnson Bends and the Cameron Wash areas. Topography consists of rolling uplands, mesa remnants, steep rocky colluvial slopes, toe slopes and fans. Slopes range from 1 to 40 percent but mostly 10 to 30 percent. Precipitation ranges from 16 to 20 inches annually. Erosion is moderate. Native vegetation is mostly grass with some aspen on the Haploborolls, and mountainmahogany, Rocky mountain juniper and ponderosa pine on the Lithic Cryorthents and rock outcrops.

Association 33

This association consists of about 45 percent Lithic Cryorthents, 40 percent Lithic Ustorthents, 10 percent Rock outcrops, and 5 percent Alluvial land.

Lithic Cryorthents have sandy clay loam, light colored surface layers over clayey decayed rock at less than 20 inches. They occur on the northern exposures of ridges under conifer.

Lithic Ustorthents have gravelly silty clay loam, light colored surface layers over bedrock at less than 20 inches. They occur on the south slopes of ridges under juniper, pinyon, mountainmahogany, and Indian ricegrass.

Rock outcrops consist of exposed bedrock and rubble. Some juniper is growing in cracks and rubble.

Alluvial land has stratified layers of sandy loam and loamy sand with very little gravel or cobble. It occurs in the bottoms of the canyons under big sagebrush, grasses and willows.

These soils are forming in alluvium derived from sandstone, siltstone, and shale. They occur at elevations of 7,600 to 8,600 feet. Topography consists of a series of northwest-southeast oriented ridges lying between the floor of the Sevier River Valley and the edge of the Paunsaugunt Plateau. The ridges are separated by deep, steep walled canyons. Slopes range from 20 to 70 percent with 40 to 60 percent most common, on northeast and southwest exposures. Precipitation ranges from 16 to 20 inches annually. Erosion is slight. Native vegetation is Douglas fir, ponderosa pine, Utah juniper, mountainmahogany, Indian ricegrass, big sagebrush, snowberry.

Association 34

This association consists of about 65 percent Lithic Ustorthents, 20 percent Cryorthents, 10 percent Alluvial land and 5 percent Rock outcrops.

Lithic Ustorthents have gravelly loam on gravelly sandy loam, light colored surface layers over bedrock at less than 20 inches.

Cryorthents have gravelly fine sandy loam, light colored surface layers and gravelly loam subsoils over very gravelly loam substrata, with 80 percent gravel at about 2 feet.

Alluvial land is moderately well drained and has clay loam surface and subsoil layers.

Rock outcrops include limestone cliffs that have some juniper in crevices and the colluvium.

These soils are forming in colluvium and residuum derived from limestone, conglomerate, shale and sandy limestone. They occur at elevations of 7,100 to 7,600 feet along the eastern edge of the Paunsaugunt Plateau in the vicinity of Red Canyon. Topography consists

of a maze of small canyons, narrow ridges, spires, pedestals, and pinnacles; many of grotesque forms. Slopes range from 5 to 70 percent with 20 to 40 percent being dominant, on all exposures. Precipitation ranges from 10 to 16 inches annually. Erosion is moderate with some deep gullies. Native vegetation is scattered ponderosa pine, juniper, manzanita and Indian ricegrass.

Association 35

This association consists of about 40 percent Cryorthents, 25 percent Typic Cryoborolls, 15 percent Cryochrepts, 10 percent Cryoboralfs, and 10 percent Rock outcrops.

Cryorthents have gravelly fine sandy loam, light colored surface layers and gravelly loam subsoils over very gravelly loam substrata, with 80 percent gravel at about 2 feet.

Typic Cryoborolls have very gravelly loam, dark colored surface layers and gravelly silt loam subsoils over stones and boulders at about 2 feet.

Cryochrepts have very gravelly silt loam, light colored surface layers and very gravelly silt loam subsoils.

Cryoboralfs have loam, light colored, very thin, surface layers and loam to gravelly loam subsoils overlying strong lime accumulations below about 12 inches.

Rock outcrops are under a sparse cover of ponderosa pine and Rocky Mountain juniper.

These soils are forming in residuum and colluvium derived from limestone and shale. They occur at elevations of 7,500 to 8,800 feet, south of Red Canyon and adjacent to the main East Fork drainage. Topography consists of colluvial slopes and rock outcrops. Slopes range from 20 to 80 percent with 30 to 45 being typical. Precipitation ranges from 14 to 20 inches annually. Erosion is moderate. Native vegetation is ponderosa pine, Douglas fir, big sagebrush, juniper, manzanita, needlegrass, Indian ricegrass and bitterbrush.

Association 36

This association consists of Calciborolls. They have extremely stony sandy loam, dark colored surface layers and gravelly loamy sand subsoils over bedrock at about 20 to 40 inches. Stone and rock cover about 40 percent of the surface.

These soils are forming in colluvium and residuum derived from basalt and limestone. They occur at elevations of 7,000 to 8,000 feet. Topography consists of ridges along the Sevier fault zone from

immediately south of Red Canyon to Lime Kiln Canyon. Slopes range from 20 to 60 percent on all exposures although east and west exposures are most common. Precipitation ranges from 10 to 12 inches annually. Erosion is moderate. Native vegetation is pinyon-juniper with a sparse ground cover of big sagebrush, bitterbrush, pricklypear, Indian ricegrass, bluebunch wheatgrass and blue grama.

Association 38

This association consists of about 60 percent Ustochrepts, 20 percent Lithic Ustorthents, 10 percent Badlands, and 10 percent Rock land.

Ustochrepts have gravelly sandy loam, thin, dark colored surface layers, gravelly on cobbly heavy clay loam subsoils with gravel, cobble and stone below 17 inches.

Lithic Ustorthents have gravelly sandy loam, light colored surface layers over bedrock at less than 20 inches.

Badlands have highly erosive, white, calcareous siltstone knobs and spires occurring in pockets generally at the head of drainage ways. Badlands support very little vegetation.

Rock land consists of cliffs, rock outcrops, talus, and exposed bedrock.

These soils are forming in colluvium and residuum derived from interbedded calcareous siltstone, shale, sandstone and sandy limestone. They occur at elevations of 7,100 to 8,200 feet. Topography consists of numerous cliffs, canyons and small mesas, between Castro Canyon and Sand Wash along the western edge of the Paunsaugunt Plateau and in the Hunt Creek area. Slopes range from 10 to 70 percent with 10 to 30 percent being most common, mainly on western exposures. Precipitation ranges from 10 to 20 inches annually. Erosion is moderate. Native vegetation is sparse to well-stocked ponderosa pine stands.

Association 39

This association consists of about 80 percent Ustorthents on the outwash fans and 20 percent Ustipsamments in the stream bottoms.

Ustorthents have gravelly loam, thin, dark colored surface layers and sandy loam to loamy sand subsoils.

Ustipsamments have sandy loam, thin, dark surface layers and sand subsoils that are weakly solidified but cut easily with a shovel. Stream channels are broad and boulder strewn.

These soils are forming in alluvium derived from basalt and calcareous sedimentary rocks. They occur at elevations of about 7,000 feet. Topography consists of alluvial outwash fans and alluvial stream bottoms along the western edge of the Paunsaugunt Plateau in the vicinity of Lime Kiln Draw and Sand Wash. Slopes range from 5 to 15 percent on westerly exposures. Precipitation ranges from 10 to 12 inches annually. Erosion is moderate. Native vegetation is pinyon pine, big sagebrush, and juniper.

Association 40

This association consists of about 50 percent Argic Cryoborolls, 40 percent Lithic Xerorthents and 10 percent Rock outcrops.

Argic Cryoborolls have fine sandy loam, dark colored surface layers and silty clay loam subsoils.

Lithic Xerorthents have loam, thin, dark colored surface layers over sandstone bedrock at less than 20 inches.

Rock outcrops are mostly on the south exposures of ridges and in crescent-shaped cuts at the head of drainage ways.

These soils are forming in colluvium derived from intermediate volcanic and calcareous sedimentary rocks. They occur at elevations of 8,000 to 8,600 feet. Topography consists of small outwash-covered benches and steep escarpments at the head of Castro Canyon, Lime Kiln Draw, Butler Wash and Sand Wash. Slopes range from 10 to 70 percent with 50 to 60 percent the dominant range. The general exposure is west. Precipitation ranges from 16 to 20 inches annually. Erosion is slight to moderate. Native vegetation is ponderosa pine, Douglas fir, Utah juniper, grass meadows and bunchgrass. Some of the meadows have been seeded.

Association 41

This association consists of about 65 percent Argiborolls, 30 percent Calciborolls, and 5 percent Haplustalfs.

Argiborolls have cobbly loam, sandy loam or gravelly sandy clay loam subsoils.

Calciborolls have very cobbly sandy loam, dark colored surface layers and very gravelly sandy loam subsoils. Coarse fragments make up about 90 percent of the substrata.

Haplustalfs have gravelly and cobbly fine sandy loam, thin, dark colored surface layers and gravelly clay loam subsoils over very cobbly sandy clay loam substrata.

These soils are forming in colluvium derived from intermediate volcanic rocks. They occur at elevations of 7,400 to 8,400 feet in the vicinity of Blind Spring Mountain and south to Highway U-12. Topography consists of low relief ridges and swales, steep colluvial slopes, steep escarpments of bedrock exposures and erosional remnants in the form of benches. Slopes range from 2 to 60 percent. Precipitation ranges from 14 to 18 inches annually. Erosion is slight to moderate. Native vegetation is a herbaceous-grass type mostly bluegrasses and wheatgrasses with some aspen and juniper along the ridge crests and stream bottoms.

Association 42

This association consists of Cryoboralfs. They have sandy loam, light colored surface layers and light sandy clay loam subsoils over loamy sand substrata.

These soils are forming in material derived from sandstone and intermediate volcanic rocks. They occur at elevations of 8,000 to 8,600 feet. Topography consists of undulating, mostly concave outwash slopes in a crescent-shaped forested area below a row of pyroclastic cliffs west of Blind Spring Mountain. Slopes range from 5 to 50 percent with 10 to 30 percent being dominant. The general exposure is northwest. Precipitation ranges from 16 to 20 inches annually. Erosion is slight. Native vegetation is ponderosa pine, Douglas fir, aspen and Engelmann spruce overstory with dwarf juniper, snowberry, lupine, rockcress, blue wildrye, bluegrasses and wheatgrasses.

Association 43

This association consists of about 30 percent Boralfic Cryoborolls, 30 percent Cryoboralfs, 20 percent Cryochrepts, 15 percent Rock land, and 5 percent Alluvial land.

Boralfic Cryoborolls have silt loam, dark colored surface layers, loam bleached subsurface layers and gravelly sandy clay loam to gravelly loam subsoils over very cobbly sandy loam substrata.

Cryoboralfs have gravelly loam to cobbly fine sandy loam, thin, dark colored surface layers and very gravelly light clay loam subsoils over stone and cobble. Some of these soils have bleached cobbly sandy loam subsurface layers.

Cryochrepts have loam, thin, dark colored surface layers, light clay loam and stony clay loam subsoils, over very cobbly substrata.

Rock land includes cliffs, rimrock, and loose talus.

Alluvial land is generally deep stratified alluvium with 10 to 30 percent gravel. It has gullies 3 to 20 feet deep.

These soils are forming in colluvium and alluvium derived from intermediate volcanic rocks. They occur at elevations of 8,300 to 10,800 feet. Topography consists of north facing colluvial slopes extending from Mount Dutton, with narrow creek bottoms and numerous rock outcrops. Slopes range from 10 to 80 percent with 30 to 50 percent most common. Precipitation ranges from 18 to 30 inches annually. Erosion is slight. Native vegetation is pinyon pine, juniper, and ponderosa pine at the lower elevations, and Douglas fir, white fir, and Engelmann spruce at the higher elevations. Some pure and mixed stands of aspen are above 8,300 feet elevation.

Association 44

This association consists of about 40 percent Argic Cryoborolls, 25 percent Boralfic Cryoborolls, 20 percent Typic Cryoborolls, 10 percent Cryoboralfs, and 5 percent Rock land.

Argic Cryoborolls have cobbly fine sandy loam, dark colored surface layers and cobbly to very cobbly clay loam subsoils over very cobbly loam substrata. Some areas have very gravelly surface layers.

Boralfic Cryoborolls have fine sandy loam, dark colored surface layers and very gravelly sandy clay loam subsoils.

Typic Cryoborolls have gravelly loam, dark colored surface layers and cobbly light clay loam subsoils over angular basaltic stone and cobble colluvium.

Cryoboralfs have loam, thin, dark colored surface layers and clay to gravelly clay loam subsoil.

Rock land consists of exposed bedrock and rock outcrops with a few conifer trees.

These soils are forming in colluvium and residuum derived from rhyolite, basalt and other volcanic rocks. They occur at elevations of 8,900 to 11,100 feet. Topography consists of numerous ridges on the highest part of the Sevier Plateau surrounding Mount Dutton Peak. Slopes range from 10 to 60 percent with 15 to 35 percent being dominant. Precipitation ranges from 18 to 30 inches annually. Erosion is slight. Native vegetation is aspen, Douglas fir, blue spruce, white fir, big sagebrush, junegrass, needleandthread, squirreltail, and blue-bunch wheatgrass.

Association 45

This association consists of about 60 percent Cryochrepts, 30 percent Cryoborolls and 10 percent Rock land.

Cryochrepts have loam, thin, dark colored surface layers and gravelly silty clay loam on clay loam subsoils on the upper part of the slopes of northern exposures.

Cryoborolls have loam or gravelly loam, dark colored surface layers over subsoils composed of 70 percent colluvial stone and 30 percent heavy loam.

Rock land consists of cliffs, talus and rock outcrops.

These soils are forming in residuum and colluvium derived from intermediate volcanic rocks. They occur at elevations of 8,000 to 8,700 feet. Topography consists of steep sharp ridges northwest of Mount Dutton. Chokecherry, Lost Bull Rush, and Horse Valley Creeks pass through this mapping unit. Slopes range from 20 to 70 percent with 30 to 50 percent being dominant. The dominant exposure is to the northwest. Precipitation ranges from 16 to 20 inches annually. Erosion is slight. Native vegetation is mainly mountainmahogany, pinyon pine and juniper. Douglas fir and ponderosa pine occur on about 20 percent of the area.

Association 46

This association consists of about 60 percent Argiborolls, 30 percent Lithic Argiborolls, and 10 percent Haploborolls.

Argiborolls have fine gravelly loam to sandy loam surface layers, some of which are cobbly and gravelly clay loam to clay loam subsoils.

Lithic Argiborolls have silt loam on cobbly silt loam, dark colored surface layers and stony heavy clay loam subsoils over bed-rock at less than 20 inches.

Haploborolls have very cobbly sandy loam, dark colored surface layers and very gravelly loamy sand subsoils.

These soils are forming in residuum, alluvium and colluvium derived from intermediate volcanic rocks. They occur at elevations of 7,200 to 8,400 feet on the western flanks of both the Sevier and the Aquarius Plateaus. Topography consists of rounded low relief ridges and accumulation areas that are usually small in size. Slopes range from 1 to 40 percent with 15 to 30 percent being dominant with a general westerly exposure. Precipitation ranges from 18 to 22 inches annually. Erosion is slight. Native vegetation is brush type with big sagebrush, bitterbrush, rabbitbrush, serviceberry, bluegrass, wheatgrass and Indian ricegrass.

Association 47

This association consists of about 60 percent Lithic Argiborolls, 30 percent Lithic Haploborolls, 5 percent Alluvial land and 5 percent Rock land.

Lithic Argiborolls have cobbly loam, dark colored surface layers and gravelly sandy loam subsoils over bedrock at less than 20 inches.

Alluvial land has sandy loam surface layers over angular and rounded gravel and cobble.

Lithic Haploborolls have gravelly loam, dark colored surface layers and gravelly sandy loam subsoils over bedrock at less than 20 inches.

Rock land has less than 6 inches of sandy loam material over bedrock.

These soils are forming in residuum, colluvium and alluvium, derived from intermediate volcanic and sandstone rocks. They occur at elevations of 7,400 to 8,500 feet. Topography consists of a series of low hills and ridges mainly on the northwest perimeter of the Sevier Plateau. Chokecherry, Lost and Horse Valley Creeks pass through this unit. Slopes range from 10 to 50 percent, mainly 20 to 40 percent on all exposures. Precipitation ranges from 15 to 20 inches annually. Erosion is slight to moderate. Native vegetation is pinyon pine, Rocky Mountain juniper, big sagebrush, bitterbrush, Indian ricegrass, blue grama and mutton grass.

Association 48

This association consists of Ustochrepts. About 60 percent of these soils have sandy loam, light colored surface layers and clay subsoils with strong lime accumulations. About 40 percent have light silty clay loam, light colored surface layers and gravelly or cobbly white subsoils with strong lime accumulations.

These soils are forming in alluvium derived from volcanic and sedimentary rocks. They occur at elevations of 7,000 to 7,800 feet. Topography consists of outwash slopes that extend in a northwest direction from the ridge system that forms the bulk of the Sevier Plateau. A faultline ridge cuts across the foot of these slopes and has caused an accumulation of alluvial material that forms alluvial fans. Slopes range from 3 to 10 percent with a general northwest exposure. Precipitation ranges from 12 to 16 inches annually. Erosion is slight to moderate. Native vegetation is pinyon pine and juniper with minor amounts of sagebrush, bitterbrush, cheatgrass, grama, and prickly pear.

Association 49

This association consists of Argic Cryoborolls. About 70 percent of these soils have very fine sandy loam, dark colored surface layers, very cobbly fine sandy loam bleached subsurface layers and subsoils consisting of a heavy clay film on channery basalt. About 30 percent of the soils have gravelly fine sandy loam, dark colored surface layers and gravelly sandy clay loam subsoils over bedrock at about 30 inches.

These soils are forming in residuum derived from dense basaltic rocks. They occur at elevations of 9,000 to 10,000 feet. Topography consists of rolling uplands (mountain tops) on the top of the Sevier Plateau in the vicinity of Jones Corral-Winnemucca Flats area. Slopes range from 5 to 20 percent with a general northeast exposure. Precipitation ranges from 20 to 30 inches annually. Erosion is slight. Native vegetation is aspen with a grass and sagebrush understory.

Association 50

This association consists of about 55 percent Argic Cryoborolls, 40 percent Typic Cryoborolls and 5 percent Pediment on terrace sideslopes.

Argic Cryoborolls have sandy loam, dark colored surface layers and gravelly heavy loam or gravelly sandy clay loam subsoils over gravel and cobble with about 5 percent soil.

Typic Cryoborolls have gravelly fine sandy loam, dark colored surface layers and gravelly light sandy clay loam subsoils over very cobbly loam substrata, with 80 percent cobble and gravel.

Pediment on terrace sideslopes have very gravelly clay loam soil material.

These soils are forming in alluvium and aeolian material derived from basalt, sandstone and shale. They occur at elevations of 7,600 to 8,500 feet. Topography consists of gently sloping old pediment slopes and terrace sideslopes. Slopes range from 1 to 5 percent over most of the area with terrace sideslopes up to 30 percent. Precipitation ranges from 14 to 18 inches annually. Erosion is slight in the Cryoborolls and moderate in the terrace sideslopes. Native vegetation is black sagebrush, rabbitbrush, juniper, phlox, blue grama, Indian ricegrass, needleandthread, and wheatgrasses.

Association 52

This association consists of about 50 percent Lithic Ustorthents, 30 percent Haplustalfs, 15 percent Rock land, and 5 percent Alluvial land.

Lithic Ustorthents have loamy sand to heavy sandy loam, light colored surface layers over bedrock at 4 to 10 inches.

Haplustalfs have gravelly loam to light clay loam, light colored surface layers and gravelly heavy clay loam subsoils over very gravelly clay loam substrata (75 percent gravel).

Rock land consists of cliffs, outcrops, talus and areas with up to 6 inches of soil over bedrock.

Alluvial land has sandy loam surface layers and gravelly and sandy subsoils and substrata.

These soils are forming in material derived from limestone, calcareous sandstone, volcanic lahara and ignimbrites with some shale. They occur at elevations of 7,000 to 8,000 feet. Topography consists of dissected spur ridges on the western edge of the Sevier Plateau between San Wash and Smith Canyon. Slopes range from 20 to 60 percent in most places with a western exposure. Precipitation ranges from 12 to 16 inches annually. Erosion is slight. Native vegetation is pinyon pine and juniper in most places with Douglas fir, ponderosa pine, Engelmann spruce and Narrowleaf cottonwood in scattered stands. Shrubs include big sagebrush, rabbitbrush and mountainmahogany.

Association 53

This association consists of Argiborolls. They have loam, dark colored surface layers and cobbly clay loam subsoils.

These soils are forming in alluvium derived from intermediate volcanic rocks. They occur at elevations of 7,400 to 8,000 feet. Topography consists of a dissected depositional bench at the head of Birch and Pine Creeks east of Circleville. Slopes range from 10 to 15 percent on southerly and easterly exposures. Precipitation ranges from 14 to 18 inches annually. Erosion is slight. Native vegetation is sagebrush-grass type with snowberry, balsamroot, Indian ricegrass, eriogonum, pussytoes, wheatgrass, brome grass and Indian paintbrush in minor amounts.

Association 54

This association consists of about 80 percent Lithic Haplustalfs, 15 percent Alluvial land and 5 percent Rock land.

Lithic Haplustalfs are composed of about half gravelly heavy loam, light colored surface layers and very cobbly, heavy clay loam subsoil. Half of them have silt loam, thin, dark colored surface layers and very gravelly clay loam subsoils with 80 percent cobble and gravel.

Alluvial land has very stony material on small alluvial fans.

Rock land consists of rock outcrops and cliffs.

These soils are forming in residuum, colluvium and alluvium derived from intermediate volcanic rocks. They occur at elevations of 6,600 to 7,600 feet. Topography consists of a downthrow fault block adjacent to the Sevier Valley near Junction and Circleville. Slopes range from near vertical canyon walls to nearly level depositional areas at the mouths of canyons. The dominant range is 20 to 40 percent. Precipitation ranges from 14 to 18 inches annually. Erosion is moderate. Native vegetation is juniper, pinyon pine, big sagebrush, and Indian ricegrass.

Association 57

This association consists of about 45 percent Cryoboralfs, 45 percent Lithic Argic Cryoborolls, 10 percent Rock land.

Cryoboralfs have sandy loam, thin, dark colored surface layers and very cobbly or very stony clay loam subsoils with 90 percent stone and cobble.

Lithic Argic Cryoborolls have stony loam, dark colored surface layers and very stony clay loam subsoils with 90 percent stone and cobble, over bedrock at less than 20 inches.

Rock land consists of rock outcrops and talus.

These soils are forming in residuum derived from intermediate volcanic rocks. They occur at elevations of 8,200 to 9,800 feet. Topography consists of a dissected fault scarp and several lower spur ridges on the east side of Circleville Mountain. Slopes range from 20 to 80 percent, mainly 40 to 70 percent easterly exposures. North and south exposures occur on the spur ridges. Precipitation ranges from 20 to 28 inches annually. Erosion is slight to moderate. Native vegetation is Douglas fir, white fir, aspen, bitterbrush, mountainmahogany, big sagebrush, ceanothus, snowberry, wildrose, Oregon grape and wheatgrass.

Association 58

This association consists of Argiborolls. They have gravelly silt loam to heavy loam, dark colored surface layers and gravelly clay to very gravelly clay subsoils with 30 to 70 percent gravel and cobble.

These soils are forming in alluvium and colluvium derived from intermediate volcanic rocks. They occur at elevations of 7,200 to

8,000 feet. Topography consists of outwash surfaces at the base of a large fault scarp. Slopes range from 10 to 30 percent on easterly exposures. Precipitation ranges from 16 to 20 inches annually. Erosion is slight. Native vegetation is mainly sagebrush, grass, pinyon and juniper with some oakbrush, bitterbrush and rabbitbrush. Grasses include blue grama, Indian ricegrass and wheatgrasses.

Association 59

This association consists of about 60 percent Argic Cryoborolls, 30 percent Cryorthents and 10 percent Cryoboralfs.

Argic Cryoborolls have loam, dark colored surface layers and cobbly clay loam subsoils over very gravelly loam substrata.

Cryorthents have gravelly heavy loam, thin, dark colored surface layers and very cobbly clay subsoils with 70 percent stone and cobble.

Cryoboralfs have silt loam, thin, dark colored surface layers and silty clay subsoils.

These soils are forming in alluvium derived from basic intermediate to acid volcanic rocks. They occur at elevations of 9,000 to 9,700 feet. Topography consists of a series of benches at the head of City Creek drainage west of Junction. Slopes range from 1 to 10 percent on the benches and 35 to 70 percent between the benches, on all exposures. Precipitation ranges from 28 to 32 inches annually. Erosion is slight. Native vegetation is Engelmann spruce and alpine fir on the steeper slopes, meadow vegetation on the concave benches, and aspen and conifer on the convex benches.

Association 60

This association consists of about 90 percent Cryorthents and 10 percent Rock land.

Cryorthents have gravelly loam, thin, dark colored, or light colored surface layers over very gravelly loamy sand to loose gravel and cobble.

Rock land consists of rock slides and talus along the upper boundaries of the unit.

These soils are forming in colluvium derived from intermediate volcanic rocks. They occur at elevations of 8,000 to 9,800 feet. Topography consists of steep faulted ridges, headwall slopes and stream-cut canyons. Slopes range from 10 to 80 percent but mainly 30 to 50 percent on all exposures. Precipitation ranges from 20 to 30 inches annually. Erosion is slight. Native vegetation is of

three types; at the highest elevation it consists of an alpine-shrub type with currant, snowberry, goldenweed, yarrow, wheatgrass and fescue. Immediately below this is the spruce-fir type with Engelmann spruce, subalpine fir, currant and snowberry. Below this are Douglas fir and aspen.

Association 61

This association consists of about 50 percent Lithic Argic Cryoborolls, 30 percent Cryorthents, 10 percent Cryoboralfs and 10 percent Rock land.

Lithic Argic Cryoborolls have very gravelly loam, dark colored surface layers and very gravelly loam subsoils.

Cryorthents have gravelly loamy sand to gravelly loam, thin, dark colored on light colored surface layers over very gravelly material.

Cryoboralfs have gravelly loam, light colored surface layers and very gravelly clay loam subsoils with 50 percent gravel.

Rock land consists of rock slides and talus.

These soils are forming in residuum and colluvium derived from rhyolite. They occur at elevations of 9,800 to 12,100 feet. Topography consists of broad rounded ridges and knolls. Slopes range from 10 to 80 percent but mainly 20 to 40 percent. Precipitation ranges from 30 to 40 inches annually. Erosion is slight to moderate. Native vegetation is mat forming shrubs, phlox, sedges, and alpine grasses.

Association 62

This association consists of Haploborolls. They have very gravelly loam, dark colored surface layers and gravelly heavy loam subsoils over sand, gravel and stones at about 24 inches.

These soils are forming in colluvium derived mostly from intermediate volcanic rocks with some sedimentary. They occur at elevations of 7,000 to 8,000 feet. Topography consists of spur ridges near Bullion Canyon and Beaver Creek. Slopes range from 30 to 80 percent with 50 to 70 percent most common on southerly exposures. Precipitation ranges from 16 to 20 inches annually. Erosion is moderate. Native vegetation is mountainmahogany, oakbrush, big sagebrush and mountain maple.

Association 63

This association consists of about 35 percent Boralfic Argiborolls, 30 percent Lithic Ustorthents, 20 percent Ustochrepts, and 15 percent Paleborolls.

Boralfic Argiborolls have loam, dark colored surface layers, gravelly heavy sandy loam bleached subsurface layers and gravelly clay loam subsoil.

Lithic Ustorthents have gravelly loam or loam, light colored surface layers over volcanic bedrock at about 8 inches.

Ustochrepts have gravelly loam, light colored surface layers and gravelly clay loam subsoils.

Paleborolls have gravelly loam, dark colored surface layers and gravelly light clay subsoils.

These soils are forming in residuum derived from intermediate volcanic, limestone and calcareous sandstone rocks. They occur at elevations of 7,000 to 8,000 feet. Topography consists of dissected mountain slopes on the north side of the Tushar Peaks. Slopes range from 10 to 50 percent with generally northerly exposures. Precipitation ranges from 16 to 20 inches annually. Erosion is slight to moderate. Native vegetation is pinyon pine, juniper, aspen, big sagebrush, oakbrush, mountainmahogany, wheatgrass and snowberry.

Association 63a

This association consists of about 60 percent Paleborolls, 30 percent Lithic Ustorthents and 10 percent Boralfic Argiborolls.

Paleborolls have gravelly loam, dark colored surface layers and gravelly light clay subsoils.

Lithic Ustorthents have gravelly loam on loam, light colored surface layers over volcanic bedrock at about 8 inches.

Boralfic Argiborolls have loam, dark colored surface layers, gravelly heavy sandy loam bleached subsurface layers and gravelly clay loam subsoils.

These soils are forming in residuum derived from intermediate volcanic, limestone and calcareous sandstone rocks. They occur at elevations of 7,000 to 8,000 feet. Topography consists of dissected mountain slopes on the north side of the Tushar Peaks. Slopes range from 10 to 15 percent mainly on northerly exposures. Precipitation ranges from 16 to 20 inches annually. Erosion is slight to moderate. Native vegetation is pinyon pine, juniper, aspen, big sagebrush, oakbrush, mountainmahogany, wheatgrass and snowberry.

Association 64

This association consists of about 60 percent Palexerolls, 30 percent Argixerolls and 10 percent Xerochrepts.

Palexerolls have gravelly loamy sand to sandy loam, dark colored surface layers and fine gravelly clay loam subsoils over strongly cemented hardpans at about 28 inches.

Argixerolls have loam, dark colored surface layers and heavy clay loam subsoils.

Xerochrepts have sandy loam on gravelly sandy loam, light colored surface layers and cobbly sandy clay loam subsoils over lime-coated gravel.

These soils are forming in alluvium derived from intermediate volcanic, calcareous tuff, basalt and minor amounts of limestone and sandstone rocks. They occur at elevations of 6,800 to 7,800 feet. Topography consists of low relief ridges and broad hummocky flats. Slopes range from 2 to 40 percent, mainly 10 to 30 percent on all exposures. Precipitation ranges from 12 to 16 inches annually. Erosion is slight. Native vegetation is pinyon pine, juniper, and big sagebrush.

Association 65

This association consists of Argiborolls. They have gravelly loam, dark colored surface layers and very cobbly clay loam subsoils. Cobbles and stones increase to 70 percent at 20 inches.

These soils are forming in colluvium derived from intermediate acidic to basic volcanic rocks with small amounts of limestone and sandstone. They occur at elevations of 7,000 to 9,000 feet. Topography consists of a dissected fault scarp in the Oak Basin area west of Junction. Slopes range from 20 to 60 percent, mainly 30 to 40 percent on easterly exposures. Precipitation ranges from 18 to 25 inches annually. Erosion is slight to moderate. Native vegetation is oakbrush, mountainmahogany, snowberry, bitterbrush, rabbitbrush, pinyon pine, juniper, wheatgrass, sedges and bluegrass.

Association 66

This association consists of about 35 percent Xerorthents, 30 percent Xerochrepts, 25 percent Alluvial land, 5 percent Badland, and 5 percent Rock land.

Xerorthents have loam, light colored surface layers over lime-coated cobble and stone.

Xerochrepts have loam, light colored surface layers and very gravelly light clay loam subsoils (50 percent gravel and cobble).

Alluvial land has deep, stony coarse textured soil material in the outwash positions and deep stony loam material adjacent to the streams.

Badland consists of eroded shale beds with sparse juniper and pinyon pine.

Rock land consists of cliffs, and other exposed bedrock with very little vegetation.

These soils are forming in alluvium derived from calcareous tuff, basalt, limestone, shale, and sandstone. They occur at elevations of 6,000 to 6,800 feet. Topography consists of terraces and old stream bottoms along Clear Creek. Slopes range from 3 to 10 percent on the terraces and alluvial land and 30 percent to vertical in the break areas, on all exposures. Precipitation ranges from 12 to 16 inches annually. Erosion is slight to moderate. Native vegetation is pinyon pine and juniper in the steep break areas; sagebrush and grass on outwash areas and terraces; and narrowleaf cottonwood and meadow grasses adjacent to the streams.

Association 67

This association consists of about 85 percent Lithic Xerochrepts and 15 percent Rock land.

Lithic Xerochrepts have gravelly loam, light colored surface layers and very cobbly limy subsoils.

Rock land consists of steep talus slopes and rock outcrops.

These soils are forming in colluvium derived from calcareous tuff, calcareous sandstone and volcanic rocks. They occur at elevations of 7,000 to 7,500 feet. Topography consists of a scarp slope extending from Joseph to Shingle Creek. Slopes range from 40 to 70 percent on all exposures. Precipitation ranges from 14 to 18 inches annually. Erosion is moderate. Native vegetation is pinyon pine, juniper, big sagebrush, bitterbrush, Indian ricegrass, eriogonum and loco.

Association 68

This association consists of about 60 percent Xerochrepts, 30 percent Calcixerolls and 10 percent Haploxerolls.

Xerochrepts have half very gravelly loam, light colored surface layers and very gravelly loam subsoils with a zone of lime accumulation at about 18 inches below the surface. The other half have light sandy loam, thin, dark colored surface layers and loamy sand subsoils with a zone of lime accumulation at about 10 inches.

Calcixerolls have loam, dark colored surface layers and clay loam subsoils with a zone of lime accumulation that is slightly indurated at about 10 inches.

Haploxerolls have silt loam, dark colored surface layers and silty clay loam subsoils.

These soils are forming in colluvium, alluvium and residuum derived from basalt, limestone, sandstone and conglomerate. They occur at elevations of 6,200 to 7,800 feet in a belt from Big Bench to Albinos Canyon on the southeast segment of the Pavant Range. Topography consists of dissected fault scarps, depositional positions above fault ridges and stream-cut mesa sides. Slopes range from 3 to 20 percent. Precipitation ranges from 16 to 18 inches annually. Erosion is slight to moderate. Native vegetation is pinyon pine, juniper, bitterbrush, big sagebrush, oakbrush, wheatgrass, and phlox.

Association 70

This association consists of about 50 percent Argixerolls, 25 percent Lithic Haploxerolls, 15 percent Haplustalfs and 10 percent Alluvial land.

Argixerolls have loam, dark colored surface layers and clay loam subsoils over loose stone and cobble at about 18 inches.

Lithic Haploxerolls have very cobbly loam, dark colored surface layers over loose stony colluvium at about 12 inches.

Haplustalfs have loam, thin, dark colored surface layers and clay loam subsoils.

Alluvial land includes a large wet and dry meadow adjacent to Three Creeks Reservoir.

These soils are forming in alluvium derived from latite. They occur at elevations of 6,800 to 8,200 feet. Topography consists of low relief ridges near Three Creeks Reservoir, Trail Mountain and Grandad Peak north of the upper Clear Creek. Slopes range from 5 to 30 percent. Precipitation ranges from 16 to 20 inches annually. Erosion is slight. Native vegetation is oakbrush, sagebrush, and wet meadow plants.

Association 71

This association consists of about 80 percent Argic Cryoborolls and 20 percent Typic Cryoborolls.

Argic Cryoborolls have loam or gravelly loam, dark colored surface layers and gravelly to very cobbly clay loam subsoils.

Typic Cryoborolls have loam, dark colored surface layers and loamy sand subsoils.

These soils are forming in alluvium derived from intermediate volcanic rocks. They occur at elevations of 7,800 to 8,500 feet. Topography consists of a series of ridges caused by local faulting from Indian Mountain to the Big Bench area on the Pavant Range west of Joseph. Slopes range from 2 to 40 percent on all exposures. Precipitation ranges from 20 to 26 inches annually. Erosion is slight to moderate. Native vegetation is aspen, oakbrush, rabbit-brush, serviceberry, big sagebrush, chokecherry, bluegrass, needlegrass, wheatgrass and blue wildrye.

Association 72

This association consists of about 70 percent Argixerolls, 15 percent Lithic Haploxerolls, 10 percent Aquic Haploxerolls, and 5 percent Typic Cryoborolls.

Argixerolls have loam, dark colored surface layers and gravelly clay loam subsoils (40 percent gravel and cobble).

Lithic Haploxerolls have gravelly loam, dark colored surface layers and very cobbly heavy loam subsoils with about 70 percent cobble and stone over bedrock at less than 20 inches.

Aquic Haploxerolls are somewhat poorly drained, have silt loam, dark colored surface layers and silty clay loam subsoils.

Typic Cryoborolls have loam, dark colored surface layers and loamy sand subsoils.

These soils are forming in colluvium derived from intermediate igneous rocks and some calcareous sandstone. They occur at elevations of 7,600 to 8,200 feet. Topography consists of fault scarps between Sam Stowe and North/South Creeks on the east face of the Pavant Range west of Joseph, colluvial slopes, rounded ridgetops and depressional swales. Slopes are from less than 5 to 50 percent with 20 to 35 percent the most common. Precipitation ranges from 20 to 26 inches annually. Erosion is slight. Native vegetation is aspen, big sagebrush, oakbrush, snowberry, needlegrass and brome grass.

Association 73

This association consists of about 90 percent Xerochrepts and 10 percent Haploxerolls.

Xerochrepts have silt loam to heavy loam, thin, dark on light colored surface layers and silty clay loam subsoils over gravelly or very gravelly distinct lime horizons at about 17 inches.

Haploxerolls have very fine sandy loam, dark colored surface layers and clay loam subsoils.

These soils are forming in residuum derived from limestone and calcareous sandstone with minor amounts of intermediate volcanic rocks. They occur at elevations of 7,200 to 8,000 feet. Topography consists of an area of low relief fault ridges. Slopes range from 3 to 40 percent, mainly 10 to 25 percent on easterly exposures. Precipitation ranges from 14 to 18 inches annually. Erosion is slight to moderate. Native vegetation is sagebrush, oakbrush, bitterbrush, mountainmahogany, snowberry, wheatgrass and bluegrass.

Association 75

This association consists of about 70 percent Lithic Xerochrepts and 30 percent Rock outcrop.

Lithic Xerochrepts have cobbly clay loam, dark colored surface layers and gravelly light clay subsoils with 45 percent gravel and cobble over bedrock at about 6 to 20 inches.

Rock outcrop consists of exposed weathering sandstone.

These soils are forming in residuum and colluvium derived from sandstone, siltstone and claystone. They occur at elevations of 5,700 to 7,000 feet. Topography consists of scarps and dissected dip slopes of tilted fault blocks. Slopes range from 3 to 70 percent, mainly 20 to 35 percent on all exposures. Precipitation ranges from 12 to 16 inches annually. Erosion is slight to moderate. Native vegetation is pinyon pine, juniper, and big sagebrush.

Association 76

This association consists of about 50 percent Paleorthids, 30 percent Xerochrepts, and 20 percent Lithic Haploxerolls.

Paleorthids have gravelly loam, thin, dark colored surface layers and gravelly clay loam subsoils over an indurated hardpan.

Xerochrepts have loam, light colored surface layers and very cobbly sandy clay loam subsoils.

Lithic Haploxerolls have loam, dark colored surface layers over well decomposed shale at 6 to 20 inches.

These soils are forming in alluvium derived from sandstone, mudstone, and shale. They occur at elevations of 7,800 to 8,200 feet. Topography consists of flats and low block ridges between Deer Creek Canyon and Flat Canyon west of Richfield, and in the Ebbs Canyon area and Wild Goose Creek on the west side of the Pavant Range. Slopes range from 3 to 30 percent on all exposures. Precipitation ranges from 16 to 20 inches annually. Erosion is slight. Native vegetation is big sagebrush, rabbitbrush, horsebrush, phlox, wheatgrass and loco.

Association 77

This association consists of about 80 percent Lithic Haploxerolls, 15 percent Rock outcrop and 5 percent Alluvial land.

Lithic Haploxerolls have cobbly loam to light clay loam, dark colored surface layers and gravelly or very gravelly clay loam subsoils over bedrock at less than 20 inches.

Rock outcrop consists of exposed blocky strata in scarps and cliffs in canyon bottoms.

Alluvial land consists of very narrow strips of deep gravelly soils. Gully erosion is severe in places.

These soils are forming in colluvium derived from limestone and calcareous sandstone. They occur at elevations of 7,000 to 8,200 feet. Topography consists of stream-cut canyons on the east side of the Pavant Range. Slopes range from 3 to 75 percent, mainly 40 to 60 percent on northerly and southerly exposures. Precipitation ranges from 12 to 18 inches annually. Erosion is slight to moderate in most places. Native vegetation is pinyon pine, juniper, rabbitbrush, manzanita, slender wheatgrass, Indian ricegrass, phlox, and loco.

Association 78

This association consists of about 90 percent Cryochrepts and 10 percent Lithic Haploxerolls.

Cryochrepts have loam, thin, dark colored surface layers and cobbly silty clay loam subsoils.

Lithic Haploxerolls have gravelly heavy loam, dark colored surface layers and gravelly heavy clay loam subsoils over sandstone bedrock at less than 20 inches.

These soils are forming in residuum derived from sandstone and limestone. They occur at elevations of 7,800 to 8,400 feet.

Topography consists of junctions of spur ridges and the main ridge between Cottonwood Creek and Beehive Peak. Slopes range from 20 to 80 percent, mainly 40 to 65 percent on northerly and southerly exposures. Precipitation ranges from 20 to 24 inches annually. Erosion is slight to moderate. Native vegetation is Douglas fir, mountainmahogany, aspen, oakbrush, juniper, snowberry, Oregon grape, bedstraw, peavine and wheatgrass.

Association 79

This association consists of about 70 percent Argic Cryoborolls and 30 percent Cryochrepts.

Argic Cryoborolls have very gravelly loam, dark colored surface layers and gravelly clay loam subsoils over loose cobble and gravel at about 40 inches.

Cryochrepts have fine gravelly loam, light colored surface layers and very gravelly clay loam subsoils with 80 percent stone, cobble and gravel. The substrata are loose angular gravel, cobble and stone below about 12 inches.

These soils are forming in colluvium derived from intermediate to acidic volcanic rocks. They occur at elevations of 8,200 to 9,200 feet. Topography consists of a series of narrow ridges in the vicinity of Kimberly Mines on the north end of the Tushar Mountains. Considerable slumping and landflows are characteristic of this unit. Slopes range from 10 to 70 percent, mainly 30 to 50 percent on all exposures. Precipitation ranges from 20 to 26 inches annually. Erosion is slight. Native vegetation is a mixture of aspen, conifer and brush types. Understory in the aspen type is meadowrue, deervetch, elkweed, rock-cress, yarrow and snowberry. The brush types consist of oakbrush, serviceberry, snowberry, and manzanita.

Association 80

This association consists of about 60 percent Cryochrepts, 35 percent Cryoborolls and 5 percent Alluvial land.

Cryochrepts have heavy silt loam, dark colored surface layers and gravelly light silty clay subsoils over bedrock at about 28 inches.

Cryoborolls have gravelly loam, dark colored surface layers and very cobbly silty clay loam subsoils over very cobbly substrata with distinct lime accumulations.

Alluvial land consists of deep, stony, soil material under big sagebrush, rabbitbrush and other shrubs.

These soils are forming in material derived from limestone, calcareous sandstone, siltstone and mudstone. They occur at elevations of 8,000 to 9,200 feet. Topography consists of a large dissected dip slope. Slopes range from 10 to 60 percent, mainly 20 to 40 percent on an easterly exposure. Precipitation ranges from 18 to 20 inches annually. Erosion is slight. Native vegetation is mountainmahogany, snowberry, rose, big sagebrush, balsamroot, wheatgrass, Indian ricegrass and loco.

Association 82

This association consists of Cryochrepts. About half of these soils have heavy loam, dark colored surface layers with bright chromas and gravelly clay subsoils. About half have loam or silt loam, light colored surface layers and heavy clay loam or silty clay subsoils.

These soils are forming in residuum derived from calcareous sandstone, siltstone and limestone. They occur at elevations of 8,400 to 9,000 feet. Topography consists of slightly dissected dip slopes on the ridgecrests of the Pavant Range extending north from Beehive Peak. Slopes range from 15 to 70 percent, mainly on easterly exposures. Precipitation ranges from 20 to 30 inches annually. Erosion is slight. Native vegetation is shrub-grass type such as mountainmahogany, snowberry, rose, larkspur, lupine, fleabane, stone-seed, loco, elkweed, yarrow, wheatgrass and needlegrass.

Association 83

This association consists of about 55 percent Cryoboralfs and 45 percent Typic Cryoborolls.

Cryoboralfs have mostly cobbly fine sandy loam, light colored surface layers, cobbly fine sandy loam, bleached subsurface layers, and subsoils of the same texture. About one-third of the Cryoboralfs have gravelly loam, light colored surface layers and cobbly clay loam subsoils.

Typic Cryoborolls have cobbly fine sandy loam, dark colored surface layers and stony fine sandy loam subsoils.

These soils are forming in residuum and colluvium derived from sandstone, siltstone, mudstone and shale. They occur at elevations of 7,500 to 8,500 feet. Topography consists of mountain slopes ranging from 15 to 75 percent, mainly 40 to 60 percent on easterly exposures. Precipitation ranges from 20 to 24 inches annually. Erosion is slight to moderate. Native vegetation is aspen, Douglas fir, white fir, subalpine fir, big sagebrush and grasses.

Association 84

This association consists of about 40 percent Cryochrepts, 35 percent Cryorthents and 25 percent Typic Cryoborolls.

Cryochrepts have fine sandy loam, light colored (bleached) surface layers and gravelly sandy clay loam subsoils.

Cryorthents have extremely stony loam, light colored surface layers and very cobbly loam subsoils with about 95 percent stone and cobble.

Typic Cryoborolls have cobbly fine sandy loam, dark colored surface layers and stony fine sandy loam subsoils.

These soils are forming in residuum and colluvium derived from thick bedded sandstone, mudstone, and conglomerate rocks. They occur at elevations of 8,000 to 9,500 feet. Topography consists of highly dissected slopes ranging from 30 to 80 percent, mainly 40 to 70 percent on all exposures. Precipitation ranges from 20 to 26 inches annually. Erosion is slight. Native vegetation is white fir, sub-alpine fir, Douglas fir, Engelmann spruce, aspen, currant, snowberry, wheatgrasses and fescue.

Association 85

This association consists of about 40 percent Cryorthents, 30 percent Cryochrepts and 30 percent Typic Cryoborolls.

Cryorthents have extremely stony loam, light colored surface layers and very cobbly loam subsoils with about 95 percent stone and cobble.

Cryochrepts have fine sandy loam, bleached, light colored surface layers and gravelly sandy clay loam subsoils over very cobbly sandy clay loam substrata (55 percent cobble and gravel).

Typic Cryoborolls have cobbly fine sandy loam, dark colored surface layers and stony fine sandy loam subsoils and substrata with 3 to 5 feet of soil over bedrock.

These soils are forming in residuum and colluvium derived from sandstone, mudstone, siltstone and conglomerate rocks. They occur at elevations of 6,000 to 8,000 feet. Topography consists of the upper part of the scarp face formed by a major fault system. Slopes range from 35 to 80 percent, mainly 40 to 70 percent on all exposures. Precipitation ranges from 18 to 22 inches annually. Erosion is slight to moderate. Native vegetation is open stands of Douglas fir and juniper at lower elevations.

Association 86

This association consists of about 60 percent Haploxerolls and 40 percent Typic Cryoborolls.

Haploxerolls have cobbly very fine sandy loam, dark colored surface layers and very cobbly loamy fine sand subsoils and substrata, with 50 to 65 percent cobble and gravel.

Typic Cryoborolls have cobbly fine sandy loam, dark colored surface layers and fine sandy loam to stony fine sandy loam subsoils.

These soils are forming in glacial drift, colluvium and alluvium derived from sandstone, siltstone, mudstone and shale. They occur at elevations of 7,000 to 8,000 feet. Topography consists of ground, lateral, and recessional moraines. Slopes range from 40 to 60 percent. Precipitation ranges from 20 to 24 inches annually. Erosion is slight. Native vegetation is aspen stands with grass and sagebrush areas.

Association 87

This association consists of Haploborolls. They have stony loam, dark colored surface layers and very gravelly sandy clay loam subsoils (95 percent stone and gravel).

These soils are forming in residuum and colluvium derived from limestone, shale and dolomite. They occur at elevations of 7,000 to 8,000 feet. Topography consists of mountain slopes on the west flank of the Pavant Range. Slopes range from 25 to 70 percent, mainly 30 to 60 percent. Precipitation ranges from 18 to 20 inches annually. Erosion is slight. Native vegetation is maple, aspen, ceanothus, bitterbrush, oakbrush and sagebrush with some Douglas fir and white fir.

Association 88

This association consists of about 90 percent Haplustalfs and 10 percent Rock outcrop.

Haplustalfs have gravelly loam, light colored surface layers and cobbly clay loam subsoils over very cobbly substrata. Subsoils have 40 percent cobble and gravel and substrata more than 65 percent.

Rock outcrop includes talus.

These soils are forming in residuum and colluvium derived from quartzite, shale and limestone. They occur at elevations of 6,500 to 7,500 feet. Topography consists of mountain slopes. Slopes range from 25 to 75 percent, mainly 35 to 65 percent. Precipitation ranges from 14 to 18 inches annually. Erosion is slight to moderate. Native

vegetation is pinyon pine, juniper, oakbrush, mountainmahogany, and big sagebrush with aspen and cottonwood in the drainageways.

Association 89

This association consists of about 60 percent Paleorthids and 40 percent Haplustalfs.

Paleorthids have silt loam, light colored surface layers and stony silt loam subsoils that are strongly lime cemented at about 8 inches.

Haplustalfs have cobbly silt loam, thin, dark colored surface layers and gravelly clay subsoils over loam substrata with strong lime accumulations.

These soils are forming in residuum derived from conglomerate. They occur at elevations of 6,000 to 7,000 feet. Topography consists of moderately dissected ridges and mountain slopes in Eight Mile and Whiskey Creeks and adjacent drainages at the southern end of the Canyon range. Slopes range from 25 to 45 percent. Precipitation ranges from 14 to 18 inches annually. Erosion is slight to moderate. Native vegetation is juniper, big sagebrush, pinyon pine, mountainmahogany, oakbrush and rabbitbrush.

Association 90

This association consists of about 85 percent Argixerolls and 15 percent Rock outcrops.

Argixerolls have gravelly silt loam, dark colored surface layers and gravelly sandy clay loam, thin, subsoils over very gravelly substrata below about 13 inches.

Rock outcrops are scattered throughout the unit.

These soils are forming in residuum derived from quartzites, argilites and other sedimentary rocks. They occur at elevations of 6,500 to 7,500 feet. Topography consists of mountain slopes ranging from 35 to 50 percent. Precipitation ranges from 14 to 18 inches annually. Erosion is slight to moderate. Native vegetation is pinyon pine with minor amounts of juniper and mountainmahogany.

Association 91

This association consists of Haploxerolls. They have stony sandy loam, dark colored surface layers and stratified, cobbly sandy loam subsoils.

These soils are forming in alluvium derived from mixed sedimentary rock. They occur at elevations of 5,000 to 6,000 feet. Topography consists of alluvial fans, stream terraces and drainage bottoms. Slopes range from 5 to 25 percent. Precipitation ranges from 12 to 15 inches annually. Erosion is slight to moderate. Native vegetation is big sagebrush, rabbitbrush and maple.

Association 92

This association consists of about 35 percent Lithic Xerorthents, 35 percent Calcixerolls, 20 percent Lithic Cryorthents and 10 percent Rock outcrop.

Lithic Xerorthents have gravelly loam, light colored surface layers over bedrock within 10 inches.

Calcixerolls have very cobbly loam, dark colored surface layers and very cobbly clay loam subsoils that have strong lime accumulations in the lower part.

Lithic Cryorthents have gravelly loam, light colored surface layers and very channery clay loam subsoils over bedrock at less than 20 inches.

Rock outcrop includes talus.

These soils are forming in residuum and colluvium derived from quartzite, argillite, and shale. They occur at elevations of 7,000 to 8,000 feet in the Canyon Range and extend from the south end of the range to the north end. Topography consists of long parallel ridges and intervening strike valleys that have been cut transversely by major streams. Slopes range from 25 to 65 percent on all exposures. Precipitation ranges from 15 to 19 inches annually. Erosion is moderate. Native vegetation is sagebrush with scattered mountainmahogany.

Association 93

This association consists of about 40 percent Lithic Xerorthents, 40 percent Argixerolls and 20 percent Rock outcrop.

Lithic Xerorthents have gravelly clay loam, light colored surface layers and cobbly clay subsoils over limestone bedrock at less than 20 inches.

Argixerolls have gravelly loam, dark colored surface layers and gravelly clay loam subsoils.

Rock outcrop includes talus.

These soils are forming in residuum and colluvium derived from limestone. They occur at elevations of 6,000 to 6,800 feet in the west central part of the Canyon Range, south of Whiskey Creek on the south to Pass Canyon on the north. Topography consists of several strike valleys with intervening ridges and highly dissected side-slopes. Slopes range from 20 to 70 percent. Precipitation ranges from 14 to 17 inches annually. Erosion is moderate. Native vegetation is juniper and pinyon pine with mountainmahogany dominating the stony ridges; big sagebrush, snowberry, bitterbrush and grasses.

Association 94

This association consists of about 60 percent Lithic Xerorthents, 35 percent Xerochrepts and 5 percent Rock outcrop.

Lithic Xerorthents have cobbly loam, light colored surface layers and very stony loam subsoils over bedrock at less than 20 inches.

Xerochrepts have gravelly loam, light colored surface layers and cobbly heavy loam subsoils over very cobbly loam substrata.

Rock outcrop includes talus.

These soils are forming in residuum derived from dolomite. They occur at elevations of 6,500 to 7,500 feet in the east flank of the Canyon Range. Topography consists of steep-walled canyons. Slopes range from 35 to 70 percent. Precipitation ranges from 16 to 20 inches annually. Erosion is moderate. Native vegetation is pinyon pine, juniper and mountainmahogany on the south exposures and Douglas fir and white fir on the north exposures.

Association 95

This association consists of about 90 percent Xerochrepts and 10 percent Alluvial land.

Xerochrepts have stony on bouldery sandy loam, thin, dark colored surface layers and very cobbly loam subsoils with 65 percent cobble and stone.

Alluvial land consists of stratified, highly variable material with a stony or bouldery surface.

These soils are forming in alluvium and colluvium derived from dolomite, limestone and quartzite. They occur at elevations of 5,700 to 6,500 feet. Topography consists of coalescing alluvial fans and colluvial deposits. Slopes range from 10 to 20 percent, mainly on easterly exposures. Precipitation ranges from 13 to 15 inches annually. Erosion is slight to moderate. Native vegetation is sagebrush with scattered juniper.

Association 96

This association consists of about 40 percent Lithic Xerochrepts, 25 percent Xerochrepts and 35 percent Rock land.

Lithic Xerochrepts have gravelly loam, light colored surface layers and very cobbly loam subsoils over bedrock at less than 20 inches. Subsoil has a zone of lime accumulation and about 65 percent cobble and stone.

Xerochrepts have gravelly loam, thin, dark colored surface layers and very cobbly clay loam subsoils with a zone of lime accumulation and about 50 percent cobble and stone.

Rock land includes rubble and talus.

These soils are forming in material derived from conglomerate rocks. They occur at elevations of 6,000 to 7,000 feet. Topography consists of mountain slopes ranging from 35 to 70 percent. Precipitation ranges from 14 to 16 inches annually. Erosion is moderate. Native vegetation is juniper, pinyon, oakbrush and big sagebrush.

Association 97

This association consists of Xerochrepts. They have gravelly loam, light colored surface layers and very cobbly loam subsoils with 75 percent stone and cobble at about 8 inches. They are 3 to 8 feet deep over bedrock.

These soils are forming in material derived from conglomerate rocks. They occur at elevations of 6,000 to 7,000 feet in Wide Canyon and extending north to Fool Creek Pass. Topography consists of mountain slopes ranging from 50 to 70 percent. Precipitation ranges from 13 to 16 inches annually. Erosion is moderate to slight. Native vegetation is about 75 percent juniper, 20 percent pinyon pine and 5 percent mountainmahogany with an understory of sagebrush and grasses.

Association 99

This association consists of about 60 percent Haploborolls, 25 percent Lithic Ustorthents and 15 percent Stony land.

Haploborolls have loam on silt loam, dark colored surface layers and loam to silty clay subsoils over bedrock at 30 to 60 or more inches.

Lithic Ustorthents have gravelly loam, light colored surface layers and cobbly sandy loam subsoils over bedrock at less than 20 inches.

Stony land consists of basalt rounded boulders, stones, cobble and gravel on slopes of 25 to 45 percent.

These soils are forming in residuum and colluvium derived from sandstone, shale and basalt. They occur at elevations of 7,500 to 8,400 feet. Topography consists of small nearly level benches and alluvial swales. Slopes range from 2 to 50 percent, mainly 5 to 25 percent on southerly exposures. Precipitation ranges from 10 to 15 inches annually. Erosion is slight. Native vegetation is ponderosa pine, big sagebrush, rabbitbrush, needlegrass, Indian ricegrass and wheatgrass.

Association 100

This association consists of about 88 percent Argiborolls and 12 percent Argic Cryoborolls.

Argiborolls have very gravelly loam, dark colored surface layers and gravelly to very cobbly sandy clay loam subsoils over very gravelly loamy sand substrata at about 18 inches.

Argic Cryoborolls are about half loam to very fine sandy loam with dark colored surface layers and gravelly sandy clay loam subsoils over very cobbly substrata at about 30 inches. The other half of the Argic Cryoborolls have very gravelly sandy loam, dark colored surface layers and stony sandy clay loam subsoils over very cobbly sandy loam substrata at about 30 inches.

These soils are forming in colluvium derived from basalt, rhyolite and other mixed volcanic rocks. They occur at elevations of 7,500 to 8,500 feet. Topography consists of long narrow slopes of steep ridges in the Mount Dutton area. Slopes range from 5 to 50 percent, mainly 20 to 35 percent. Precipitation ranges from 12 to 18 inches annually. Erosion is slight to moderate. Native vegetation is pinyon pine, Rocky Mountain juniper, big sagebrush, bitterbrush, blue grama, muttongrass, bluebunch wheatgrass, and needleandthread.

Association 101

This association consists of about 80 percent Argic Cryoborolls, 10 percent Lithic Cryoborolls and 10 percent Usterts.

Argic Cryoborolls have about 60 percent very gravelly loam, dark colored surface layers and very cobbly clay loam to cobbly clay subsoils over very gravelly clay substrata. Cobble and gravel range from 40 to 60 percent. About 40 percent of the Argic Cryoborolls have cobbly and bouldery dark colored surface layers and cobbly and bouldery subsoils over bedrock at 2 to 3 feet.

Lithic Cryoborolls have stony, dark colored surface layers over bedrock at 12 to 18 inches.

Usterts have clayey surface layers and subsoils that crack appreciably when dry.

These soils are forming in materials derived from basalt and andesite. They occur at elevations of 9,000 to 10,000 feet. Topography consists of gently sloping tableland on Table Mountain north and east of Mount Dutton. It has several narrow shallow drainage ways. Slopes range from 7 to 12 percent. Precipitation ranges from 20 to 30 inches annually. Erosion is slight. Native vegetation is sagebrush, snowberry, aspen, sheep fescue, Idaho fescue, needleandthread, Junegrass and bluebunch wheatgrass.

Association 102

This association consists of about 40 percent Argic Cryoborolls, 25 percent Calcic Cryoborolls, 15 percent Lithic Cryochrepts, 15 percent Lithic Cryoboralfs and 5 percent Rock outcrop.

Argic Cryoborolls have silt loam, dark colored surface layers and silty clay loam subsoils over gravelly loam substrata that have lime accumulations at 18 to 24 inches.

Calcic Cryoborolls have silt loam, dark colored surface layers and gravelly to very gravelly silt loam subsoils and substrata that have lime accumulations at 9 to 16 inches.

Lithic Cryochrepts have loam, thin, dark colored surface layers and very gravelly silt loam subsoils over bedrock at 9 to 20 inches.

Lithic Cryoboralfs have rocky silt loam, thin, dark colored surface layers over bedrock at about 6 inches.

Rock outcrop consists of fractured limestone bedrock, outcrops and cliffs.

These soils are forming in residuum derived from limestone and shale. They occur at elevations of 8,300 to 8,700 feet. Topography consists of a mesa top on Whitman Bench in the East Fork drainage of the Sevier River. Slopes range from 0 to 5 percent, mainly on northerly exposures. Precipitation ranges from 18 to 22 inches annually. Erosion is slight. Native vegetation is ponderosa pine, Douglas fir, Rocky Mountain juniper, bitterbrush, manzanita, sagebrush, Indian ricegrass, muttongrass and needleandthread.

Association 103

This association consists of about 40 percent Calcic Cryoborolls, 35 percent Typic Cryoborolls, 15 percent Argic Cryoborolls, 5 percent Cryorthents, and 5 percent Lithic Cryoborolls.

Calcic Cryoborolls have loam, dark colored surface layers and loam to gravelly silt loam subsoils.

Typic Cryoborolls have very gravelly loam, dark colored surface layers and gravelly silt loam subsoils over 95 percent stones and cobble at about 26 inches.

Argic Cryoborolls have silt loam, dark colored surface layers and silty clay loam subsoils over gravelly loam substrata that have lime accumulations at 18 to 24 inches.

Cryorthents have gravelly very fine sandy loam, thin, dark colored surface layers and gravelly loam subsoils over very gravelly loam substrata at about 20 inches.

Lithic Cryoborolls have gravelly loam, dark colored surface layers and very gravelly loam subsoils and substrata.

These soils are forming in colluvium and residuum derived from limestone and shale. They occur at elevations of 7,600 to 8,600 feet. Topography consists of gently sloping benches to strongly sloping toeslopes and isolated mesa tops. Slopes range from 1 to 35 percent, mainly on northerly exposures. Precipitation ranges from 16 to 22 inches annually. Erosion is slight to moderate. Native vegetation is ponderosa pine, Rocky Mountain juniper, bitterbrush, snakeweed, snowberry, black sagebrush, rabbitbrush, currant, Indian ricegrass, slender wheatgrass, needleandthread, and squirreltail.

Association 104

This association consists of about 60 percent Ustochrepts, 30 percent Calciborolls and 10 percent Haploborolls.

Ustochrepts have very gravelly sandy loam, thin, dark colored surface layers and very gravelly sandy loam subsoils and substrata.

Calciborolls have gravelly sandy loam to loam, dark colored surface layers and gravelly heavy loam subsoils over limestone bedrock at about 3 feet.

Haploborolls have silt loam, dark colored surface layers and silty clay loam to silty clay subsoils.

These soils are forming in alluvium derived from basalt and sedimentary rocks. They occur at elevations of 7,500 to 7,900 feet. Topography consists of old terraces that are dissected by numerous small drainage ways with intermittent streams. Slopes range from 1 to 3 percent on the terraces, mainly on east and northeast exposures. Precipitation ranges from 14 to 18 inches annually. Erosion is slight. Native vegetation is black sagebrush, rabbitbrush, Indian ricegrass, needleandthread, wheatgrass and scattered Rocky Mountain juniper.

Association 105

This association consists of about 80 percent Argic Cryoborolls, 15 percent Ustochrepts and 5 percent Argiborolls.

Argic Cryoborolls have gravelly sandy loam to light loam, dark colored surface layers and gravelly sandy clay loam subsoils over very gravelly or gravelly sandy loam substrata (45-90 percent gravel and cobble).

Ustochrepts have gravelly sandy loam, thin, dark colored surface layers and cobbly heavy clay loam subsoils.

Argiborolls have gravelly fine sandy loam, dark colored surface layers and gravelly sandy clay loam subsoils over very cobbly sandy clay loam (80 percent cobble and gravel).

These soils are forming in colluvium and alluvium derived from basalt and other volcanic rocks. They occur at elevations of 8,400 to 9,200 feet. Topography consists of colluvial slopes, steep ridges and narrow valleys, mainly in the East Hunt Creek and West Hunt Creek drainages on the southern end of the Sevier Plateau. Slopes range from 5 to 50 percent, mainly southeast exposures. Precipitation ranges from 16 to 24 inches annually. Erosion is slight to moderate. Native vegetation is big sagebrush, rabbitbrush, snowberry, Rocky Mountain juniper, pinyon pine and western yarrow.

Association 106

This association consists of Cryoborolls.

Cryoborolls have gravelly loam, dark colored surface layers, gravelly sandy loam bleached subsurface layers and gravelly heavy clay loam subsoils over very gravelly clay loam substrata below 4 feet.

These soils are forming in material derived from volcanic rocks. They occur at elevations of 8,500 to 10,000 feet. Topography consists of a plateau and mountain slopes. Slopes range from 25 to 65 percent

on all exposures. Precipitation ranges from 18 to 28 inches annually. Erosion is moderate. Native vegetation is aspen with an understory of Oregon grape, lupine, larkspur, bluebunch wheatgrass and carex species.

Association 107

This association consists of Cryoboralfs.

Cryoboralfs have very gravelly loam, thin, light colored surface layers and very cobbly clay loam subsoils with about 65 percent cobble over very cobbly sand loam substrata.

These soils are forming in material derived from volcanic rocks. They occur at elevations of 8,500 to 9,500 feet. Topography consists of mountain slopes ranging from 15 to 45 percent. Precipitation ranges from 18 to 25 inches annually. Erosion is slight. Native vegetation is big sagebrush, Idaho fescue, bluebunch wheatgrass, and bitterbrush with scattered clumps of aspen.

Association 108

This association consists of Rock outcrop, Basalt Talus, Cryoboralfs, and Cryoborolls in undetermined proportions.

Cryoboralfs have extremely stony or bouldery clay loam, light colored surface layers and cobbly clay subsoils under conifer overstory.

Cryoborolls have extremely stony or bouldery loam, dark colored surface layers, gravelly sandy loam bleached subsurface layers and gravelly heavy clay loam subsoils over very cobbly clay loam substrata under aspen overstory.

These soils are forming in material derived from volcanic rocks. They occur at elevations of about 10,000 feet. Topography consists of a plateau with slopes ranging from 10 to 65 percent, mainly 10 to 40 percent. Precipitation is about 25 inches annually. Erosion is slight. Native vegetation is aspen and conifer.

Association 109

This association consists of Argic Cryoborolls. About 30 percent have gravelly loam, dark colored surface layers and gravelly and cobbly heavy sandy clay loam subsoils. About 30 percent have very gravelly fine sand loam to loam, dark colored surface layers and cobbly sandy clay loam subsoils over very cobbly sandy loam substrata. About 20 percent have fine sandy loam, dark colored surface layers,

very cobbly very fine sandy loam bleached subsurface layers and very cobbly heavy clay loam subsoils over very cobbly (sandy) clay loam substrata. About 15 percent have loam to very fine sandy loam, dark colored surface layers and gravelly sandy clay loam subsoils.

These soils are forming in residuum and alluvium derived from volcanic rocks. They occur at elevations of 8,500 to 9,200 feet. Topography consists of alluvial and colluvial slopes of well dissected pediment slopes between Willow Spring Creek and Cottonwood Creek south and east of Winnemucca Flats on the east slopes of the Sevier Plateau. Slopes range from 3 to 35 percent, mainly 5 to 25 percent on north and south exposures. Precipitation ranges from 15 to 22 inches annually. Erosion is slight. Native vegetation is big sagebrush, grasses, aspen, bitterbrush, snowberry, rabbitbrush, and a few scattered juniper.

Association 110

This association consists of about 55 percent Argic Cryoborolls, 30 percent Cryoboralfs, 10 percent Typic Cryoborolls and 5 percent Rock outcrops, Talus, Rubble land and recent landslide areas.

About two-thirds of the Argic Cryoborolls have gravelly silt loam, dark colored surface layers and very cobbly clay subsoils over very cobbly sandy clay substrata.

About one-third of the Argic Cryoborolls have loam, dark colored surface layers and clay subsoils over sandy loam substrata.

Cryoboralfs have stony clay loam, light colored surface layers and cobbly clay subsoils with 35 to 45 percent cobble and stones.

Typic Cryoborolls have silt loam, dark colored surface layers and clay loam subsoils over gravelly clay loam and gravelly clay substrata.

These soils are forming in material derived from volcanic rocks such as ignimbrites, lahars and basalt with some sedimentary rocks. They occur at elevations of 8,000 to 10,000 feet. Topography consists of areas of land mass movement consisting of long undulating ridge-like units. Slopes range from 10 to 75 percent, mainly 25 to 65 percent. Precipitation ranges from 18 to 28 inches annually. Native vegetation is aspen with some conifer such as Engelmann spruce, Douglas fir and white and subalpine fir.

Association 111

This association consists of about 80 percent Cryoboralfs and 20 percent Argic Cryoborolls.

Cryoboralfs have loam to gravelly silt loam, thin, dark colored surface layers and cobbly clay subsoils over very gravelly clay loam substrata.

Argic Cryoborolls have silt loam, dark colored surface layers and silty clay loam layers of strong lime accumulation. This soil is under aspen.

These soils are forming in material derived from volcanic rocks such as basalt. They occur at elevations of 9,200 to 10,000 feet. Topography consists of undulating landflows on a plateau. Slopes range from 5 to 65 percent, mainly 20 to 40 percent. Precipitation ranges from 20 to 28 inches annually. Erosion is slight. Native vegetation is cana sagebrush, lupine, meadow ricegrass, mountain brome, peavine, big sagebrush, elderberry, serviceberry, and aspen.

Association 112

This association consists of about 60 percent cliffs, ledges and Rock outcrops, 30 percent Lithic Ustorthents, and 10 percent Alluvial land.

Lithic Ustorthents have gravelly sandy loam, thin, light colored surface layers and silty clay loam subsoils over sandstone bedrock at about 8 inches.

Alluvial land consists of stratified layers of sandy loam and loamy sand.

These soils are forming in material derived from sandstone, siltstone and shale. They occur at elevations of 7,000 to 8,000 feet. Topography consists of deep steep-walled canyons that have sharp pointed ridges along the south and southwestern edge of the Table Cliff Plateau. Slopes range from 20 to 80 percent, mainly 40 to 60 percent on all exposures. Precipitation ranges from 10 to 18 inches annually. Erosion is severe. Native vegetation is pinyon, juniper, Indian ricegrass and mountainmahogany.

Association 113

This association consists of about 50 percent Argic Cryoborolls and 50 percent Cryoboralfs.

Argic Cryoborolls have loam, dark colored surface layers and gravelly heavy sandy loam subsoils over cobbly sandy loam substrata.

Cryoboralfs mostly have gravelly fine sandy loam, light colored surface layers and clay loam subsoils. About 40 percent of the Cryoboralfs have gravelly sandy loam, light colored surface layers and very gravelly clay loam subsoils over very gravelly sandy loam substrata.

These soils are forming in alluvium and residuum derived from volcanic rocks. They occur at elevations of 10,300 to 10,600 feet. Topography consists of nearly level mountain tops. Slopes range from 1 to 20 percent, mainly 2 to 10 percent on northerly and westerly exposures. Precipitation ranges from 20 to 30 inches annually. Native vegetation is open park areas of phlox, dandelion, tansy mustard, sheep fescue, and mountain muhly intermixed with stands of subalpine fir, Douglas fir, Engelmann spruce and aspen.

Association 114

This association consists of about 75 percent Argic Cryoborolls, 15 percent Cryoboralfs and 10 percent Rock outcrops.

Argic Cryoborolls have loam, dark colored surface layers and gravelly heavy sandy loam subsoils over cobbly sandy loam substrata.

Cryoboralfs have gravelly sandy loam, light colored surface layers and clay loam to very gravelly clay loam subsoils some of which are over very gravelly sandy loam substrata.

These soils are forming in material derived from volcanic rocks. They occur at elevations of 10,300 to 10,600 feet. Topography consists of nearly level mountain tops on the Aquarius Plateau. Slopes range from 1 to 50 percent, mainly 2 to 10 percent on the flatter areas and 30 to 40 percent on the side slopes, on northwesterly to northeasterly exposures. Precipitation ranges from 20 to 30 inches annually. Native vegetation is mixed stands of subalpine fir, white fir, Douglas fir, Engelmann spruce, and aspen with open parks with phlox, dandelion, tansy mustard, sheep fescue and mountain muhly.

Association 115

This association consists of Argic Cryoborolls. Fifty percent of these have clay loam, dark colored surface layers and cobbly clay subsoils. Twenty percent have sandy loam, dark colored surface layers and sandy clay loam subsoils. Twenty percent have gravelly loam, dark colored surface layers and very gravelly clay loam subsoils. Ten percent consists of stony land.

These soils are forming in alluvium and colluvium derived from basic volcanic rocks. They occur at elevations of 8,000 to 9,000

feet. Topography consists of steep ridges and narrow valleys running parallel to the west face of Griffin Top. Slopes range from 1 to 5 percent in the narrow valleys and 20 to 30 percent on the ridges and sideslopes. Precipitation ranges from 16 to 20 inches annually. Erosion is slight. Native vegetation is big sagebrush, rabbitbrush, sheep fescue, and wheatgrasses in the alluvial bottoms and pinyon pine, juniper, ponderosa pine, bitterbrush, mountainmahogany, blue grama, Indian ricegrass and squirreltail on the ridges.

Association 116

This association consists of Argic Cryoborolls. Sixty percent have loam, dark colored surface layers and gravelly clay subsoils. Twenty percent have gravelly loam, dark colored surface layers and very gravelly clay loam subsoils. Ten percent have sandy loam dark colored surface layers and sandy clay loam subsoils. Ten percent have stony loam profiles.

These soils are forming in alluvium and colluvium derived from basalt. They occur at elevations of 8,500 to 9,500 feet. Topography consists of a bench below a steep slope that has many slumps and landslides and well rounded knobs and hills. Slopes range from 2 to 6 percent in the drainage ways and 20 to 50 percent on the knobs and hills. Precipitation ranges from 18 to 22 inches annually. Erosion is slight. Native vegetation is aspen, sagebrush, bitterbrush, sheep fescue, bluebunch wheatgrass, Indian ricegrass and mountain muhly.

Association 117

This association consists of Argiborolls.

Argiborolls have gravelly loam, dark colored surface layers and very cobbly clay loam subsoils over very cobbly clay loam substrata with more than 70 percent stone and cobble.

These soils are forming in material derived from volcanic rocks such as ignimbrites and lahars. They occur at elevations of 6,800 to 7,400 feet. Topography consists of a dissected and faulted area on the east and west slopes of the Sevier Plateau. Slopes range from 25 to 65 percent on all exposures. Precipitation ranges from 12 to 15 inches annually. Erosion is moderate. Native vegetation is big sagebrush, juniper, mountainmahogany, oakbrush clumps, rose, snowberry, rabbitbrush, yarrow, bluegrass and brome.

Association 118

This association consists of Haplustalfs.

Haplustalfs have gravelly clay loam surface layers and cobbly and very cobbly clay subsoils with 30 to 70 percent cobble that increases with depth.

These soils are forming in alluvium derived from volcanic rocks. They occur at elevations of 7,500 to 8,000 feet. Topography consists of mountain slopes, alluvial fans, and drainage ways. Slopes range from 5 to 20 percent. Precipitation ranges from 12 to 16 inches annually. Erosion is moderate. Native vegetation is big sagebrush, rabbitbrush, grasses, and clumps of oakbrush in the drainage ways.

Association 119

This association consists of about 85 percent Cryoboralfs and 15 percent Cryochrepts.

Cryoboralfs mostly have gravelly loam, thin, dark colored surface layers, gravelly sandy loam, bleached subsurface layers and stony or gravelly clay subsoils over very gravelly clay loam substrata. About 10 percent of the mapping unit is Cryoboralfs that have gravelly clay loam, light colored surface layers and stony clay loam to stony clay subsoils.

Cryochrepts have gravelly fine sandy loam, light colored surface layers, cobbly fine sandy loam bleached subsurface layers and very cobbly fine sandy loam subsoils over very cobbly loamy sand substrata.

These soils are forming in glacial material and colluvium derived from volcanic rocks. They occur at elevations of 8,200 to 10,000 feet. Topography consists of ridges and other higher relief features. Slopes range from 25 to 65 percent. Precipitation ranges from 17 to 28 inches annually. Erosion is slight. Native vegetation is mixed aspen and conifer with scattered pure stands of each. Understory includes snowberry, rose, serviceberry, clumps of oakbrush, lupine, yarrow, Sandberg bluegrass, and bluestem wheatgrass. Conifers are white and alpine fir, Douglas fir, and Engelmann spruce.

Association 120

This association consists of about 50 percent Cryoboralfs, 35 percent Argic Cryoborolls and 15 percent Aquic Cryorthents.

Cryoboralfs mostly have clay loam, thin, dark colored surface layers, silt loam bleached subsurface layers and clay subsoils over stony clay substrata. About one-third of the Cryoboralfs have very stony loam, light colored surface layers and very stony clay subsoils.

Argic Cryoborolls have stony loam, dark colored surface layers and very stony clay subsoils.

Aquic Cryorthents are imperfectly drained, have cobbly clay, dark colored surface layers and cobbly loamy sand subsoils over very cobbly sandy loam substrata.

These soils are forming in alluvium derived from volcanic rocks. They occur at elevations of 8,000 to 10,000 feet. Topography consists of meadowlands and adjacent areas. Slopes range from 5 to 25 percent, mainly 5 to 15 percent on all exposures. Precipitation ranges from 25 to 30 inches annually. Erosion is slight. Native vegetation is cana sagebrush.

Association 121

This association consists of about 95 percent Xerochrepts and 5 percent Rock land, Rock slides, Talus and Rock outcrops.

Xerochrepts mostly have cobbly clay loam, light colored surface layers and cobbly clay loam to stony clay subsoils. About 20 percent of them have stony loam light colored surface layers and very cobbly loam subsoils that have strong lime accumulations.

These soils are forming in material derived from volcanic rocks such as ignimbrites and lahars. They occur at elevations of 7,000 to 8,000 feet. Topography consists of mountain slopes. Slopes range from 20 to 60 percent, mainly on southerly and westerly exposures. Precipitation ranges from 10 to 18 inches annually. Erosion is slight. Native vegetation is big sagebrush, black sagebrush, bitterbrush and rabbitbrush.

Association 124

This association consists of about 70 percent Haplustalfs, 25 percent Argixerolls and 5 percent Rock outcrops, Rock slides and Talus.

Haplustalfs have gravelly loam, light colored surface layers and very cobbly clay loam subsoils with 50 to 60 percent cobble and stone.

Argixerolls have gravelly loam, dark colored surface layers and very cobbly clay loam subsoils with 70 percent cobble and stone.

These soils are forming in colluvium and alluvium derived from volcanic rocks. They occur at elevations of 6,500 to 7,500 feet. Topography consists of benches and colluvial slopes. Slopes range from 5 to 45 percent. Precipitation ranges from 12 to 16 inches annually. Erosion is slight. Native vegetation is big sagebrush, grass with scattered juniper and pinyon pine.

Association 126

This association consists of Xerochrepts.

Xerochrepts have clay loam, thin, dark colored surface layers and sandy clay on sandy clay loam subsoils with strong lime accumulations.

These soils are forming in alluvium and residuum derived from mixed sedimentary and basalt rocks. They occur at elevations of 6,500 to 8,000 feet. Topography consists of hilly slopes ranging from 15 to 30 percent. Precipitation ranges from 14 to 18 inches annually. Erosion is slight. Native vegetation is mainly oakbrush, with mountainmahogany, currant, snowberry, serviceberry and yarrow.

Association 127

This association consists of about 40 percent Xerorthents, 40 percent Xerochrepts and 20 percent Rock outcrops, Talus slopes, Rubble land and Alluvial land.

Xerorthents have shaly clay loam, light colored surface layers and very shaly clay subsoils over shale bedrock at about 9 inches.

Xerochrepts have silty clay loam, light colored surface layers and cobbly silty clay loam subsoils over very cobbly and shaly silty clay loam substrata. Substrata have a distinct accumulation of lime and contain 45 to 65 percent shale and cobble.

These soils are forming in residuum derived from mixed sedimentary rocks. They occur at elevations of 6,500 to 8,000 feet. Topography consists of steep escarpments. Slopes range from 30 to 70 percent. Precipitation ranges from 14 to 20 inches annually. Erosion is moderate. Native vegetation is sparse stands of juniper, pinyon pine, rabbitbrush, and buckwheat.

Association 128

This association consists of about 50 percent Xerochrepts and 50 percent Typic Haploxerolls.

Xerochrepts have very gravelly loam, thin, dark colored surface layers and gravelly clay loam subsoils with about 50 percent gravel.

Typic Haploxerolls have loam, dark colored surface layers and clay loam subsoils over sandstone bedrock at about 40 inches. Basalt surface boulders occupy 35 to 40 percent of the surface.

These soils are forming in residuum and derived from mixed sedimentary basalt rocks. They occur at elevations of 7,000 to 8,000 feet. Topography consists of dissected mountain slopes in the Lost Creek and Brushy Trail Hollow drainages. Slopes range from 30 to 40 percent. Precipitation ranges from 15 to 20 inches annually. Erosion is severe. Native vegetation is mountainmahogany, pinyon pine, juniper, serviceberry, bitterbrush, and big sagebrush. Moderately dense stands of oakbrush occur in drainage ways and side slopes of drainages.

Association 129

This association consists of Xerochrepts.

Xerochrepts have gravelly loam, light colored surface layers and silty clay subsoils over gravelly silty clay loam substrata.

These soils are forming in residuum and alluvium derived from sandstone, shale and basalt rocks. They occur at elevations of 6,000 to 8,000 feet. Topography consists of rolling and strongly sloping hills in lower Gooseberry Creek. Slopes range from 10 to 20 percent. Precipitation ranges from 14 to 20 inches annually. Erosion is moderate. Native vegetation is juniper, pinyon pine, mountainmahogany, bitterbrush, buckwheat, phlox, bunchgrasses and sedges.

Association 130

This association consists of about 60 percent Lithic Camborthids and 40 percent Calciorthids.

Lithic Camborthids have loam, light colored surface layers and gravelly clay loam subsoils over sandstone bedrock at about 15 inches.

Calciorthids have gravelly loam, light colored surface layers and very gravelly sandy loam subsoils over bedrock interbedded sandstone and shales at about 21 inches.

These soils are forming in material derived from shale, siltstones, and marlstones. They occur at elevations of 6,000 to 7,500 feet. Topography consists of stream-cut drainage ways and mesa-like broad dip-slopes in the vicinity of Salina Creek. Slopes range from 15 to 45 percent. Precipitation ranges from 10 to 12 inches annually. Erosion is slight. Native vegetation is pinyon pine, juniper, mountainmahogany, oakbrush, serviceberry, bitterbrush, big sagebrush, buckwheat and Indian ricegrass.

Association 131

This association consists of Haplargids. About 70 percent of these soils have very gravelly loam, light colored surface layers and gravelly clay loam subsoils over very gravelly clay loam substrata that is a zone of lime accumulation. Basalt boulders occupy 3 to 5 percent of the surface. About 30 percent of these soils have gravelly loam, light colored surface layers and very gravelly clay loam subsoils that contain a zone of lime accumulation at 13 to 30 inches.

These soils are forming in material derived from basalt and shale. They occur at elevations of 5,800 to 6,400 feet. Topography consists of rounded hills of subdued topography and deep drainages. Slopes range from 25 to 40 percent. Precipitation ranges from 10 to 12 inches annually. Erosion is slight. Native vegetation is juniper, pinyon pine, big sagebrush, black sagebrush, rabbitbrush, wheatgrass, and Indian ricegrass.

Association 132

This association consists of Torriorthents.

Torriorthents have channery clay, thin, dark colored surface layers and extremely channery (shaly) subsoils over bedrock at about 6 inches.

These soils are forming in residuum derived from shale, siltstone and marlstones. They occur at elevations of 5,500 to 6,000 feet. Topography consists of eroded mountain slopes. Slopes range from 20 to 40 percent. Precipitation ranges from 10 to 12 inches annually. Erosion is moderately severe to severe. Native vegetation is occasional clumps of winterfat and shadscale.

Association 133

This association consists of Xerochrepts.

Xerochrepts have loam, light colored surface layers and clay loam subsoils over cobbly loam substrata that includes a zone of lime accumulation. It has about 40 percent angular cobble and stone.

These soils are forming in alluvium derived from sandstone, shale and some basalt. They occur at elevations of 7,500 to 8,500 feet. Topography consists of alluvial fans. Slopes range from 15 to 25 percent. Precipitation ranges from 12 to 16 inches annually. Erosion, both sheet and gully, is moderately severe. Native vegetation is big sagebrush, wheatgrass, yellowbrush, and snakeweed.

Association 134

This association consists of about 50 percent Lithic Xerochrepts, 40 percent Xerochrepts and 10 percent Rock outcrops.

Lithic Xerochrepts have gravelly loam, light colored surface layers and gravelly clay loam subsoils over sandstone bedrock at about 14 inches. The subsoil has 35 percent gravel.

Xerochrepts have gravelly loam, light colored surface layers and very cobbly heavy loam subsoils with 80 percent cobble and gravel.

These soils are forming in material derived from limestone, sandstone and shale rocks. They occur at elevations of 7,000 to 8,500 feet. Topography consists of deep, stream-cut canyons and mesa-like areas adjoining Salina Creek. Slopes range from 40 to 70 percent, mainly on southerly and westerly exposures. Precipitation ranges from 12 to 18 inches annually. Erosion is severe. Native vegetation is pinyon pine, juniper, slender wheatgrass, Indian ricegrass, phlox, erigonum and manzanita.

Association 135

This association consists of Calciaquolls.

Calciaquolls are somewhat poorly drained, have heavy clay loam, dark colored surface layers and clay loam subsoils over heavy clay loam substrata. A zone of lime accumulation occurs at 27 inches.

These soils are forming in alluvium derived from extrusive igneous, sandstone, and shale rocks. They occur at elevations of 7,500 to 8,000 feet. Topography consists of valley bottoms. Slopes range from 0 to 5 percent. Precipitation ranges from 12 to 16 inches annually. Erosion is slight. Native vegetation is meadow grasses, sedges and rushes.

Association 136

This association consists of about 70 percent Xerorthents, 20 percent Lithic Xeropsamments and 10 percent Alluvial land.

Xerorthents have gravelly sandy clay loam, thin, light colored surface layers and thin, cobbly clay loam subsoils over very shaly clay loam substrata at about 12 inches.

Lithic Xeropsamments have sandy, light colored surface layers over sandstone bedrock at 6 to 18 inches.

Alluvial lands are highly stratified.

These soils are forming in colluvium derived from shale and sandstone rocks. They occur at elevations of 7,500 to 8,500 feet. Topography consists of a valley formed by a graben fault. Slopes range from 15 to 50 percent. Precipitation ranges from 12 to 16 inches annually. Erosion is moderate. Native vegetation is shrubs and grasses such as bitterbrush, big sagebrush, oakbrush, rabbitbrush, birchleaf, mountainmahogany, and Letterman needlegrass.

Association 137

This association consists of about 70 percent moderately fine textured Argic Cryoborolls and 30 percent Lithic Cryoborolls.

The Argic Cryoborolls are generally 2 to 4 feet thick over moderately fractured bedrock with 12 inch silt loam surface horizons and 12 to 36 inch stony silty clay loam subsoils overlying bedrock.

The Lithic Cryoborolls generally range from 6 inches to 2 feet thick over bedrock with 0 to 6 inches of silt loam surface horizons and 12 to 24 inches stony silty clay loam subsoils.

These soils are forming in residuum from Flagstaff limestone on ridgeland and upper sideslopes at about 9,000 feet elevation. Generally the Argic Cryoborolls support a grass-sagebrush vegetation on slopes with gradients ranging from 15 to 40 percent. The Lithic Cryoborolls support a mixed mountain shrub-forb vegetation and occur on slopes ranging dominantly from 35 to 55 percent. Normal annual precipitation ranges from 30 to 35 inches. Sheet erosion is slight on the Argic Cryoborolls. The Lithic Cryoborolls have moderate to severe sheet erosion with occasional to many gullies.

Association 138

This association is dominantly moderately deep to deep Argic Cryoborolls.

Where the soil is forming under aspen cover it is about 3 to 6 feet deep to bedrock with 12 inch dark, very fine sandy loam surface horizons and 18 to 36 inch sandy clay loam subsoils. Soils forming under conifers are generally 2 to 3 feet deep with thinner A horizons and are stony throughout.

This soil is forming in residuum from limy sandstone and shale (North Horn formation) at elevations between 8,000 to 9,000 feet. Slope gradients range from 20 to 60 percent, but dominantly from 30 to 45 percent. Annual precipitation ranges from 22 to 27 inches. Aspen stands with shrub and forb ground cover is the dominant vegetation while conifers occur on about 10 percent of the area. Small patches of mixed mountain shrub also occur.

Association 139

This association consists of about 35 percent Typic Cryoborolls, 25 percent Cryoboralfs, 15 percent Lithic Cryoborolls and 25 percent Argic Cryoborolls.

The Typic Cryoborolls have brown to light-brownish, 6 to 12 inch gravelly sandy loam to gravelly silt loam surface layers overlying 18 to 48 inches of weathered gravelly or stony fine sandy loam to silty clay loam subsoils. The soil mantle is underlain by interbedded sandstone, siltstone, and shales which are generally limy.

The Lithic Cryoborolls are about 2 feet deep to bedrock.

The Argic Cryoborolls have 8 to 18 inch very fine sandy loam dark colored surfaces and 18 to 30 inch sandy clay loam to clay loam subsoils. Depth to bedrock ranges from 3 to 5 feet. The surface layers are thinner where these soils occur at lower elevations supporting mixed mountain shrub vegetation.

These soils are forming in material from limy sandstone and shale (North Horn formation) at elevations of 8,000 to 9,500 feet. These soils occur on steep to very steep mountain slopes which have few to numerous Rock outcrops and talus, particularly on the north slopes. The Typic Cryoborolls and Cryoboralfs occur dominantly on the north aspects with slope gradients ranging from 55 to 70 percent. The soils on the south aspects are dominantly Argic Cryoborolls with Typic Cryoborolls and Lithic Cryoborolls and have slope gradients from about 20 to 25 inches with about 75 percent occurring between October and April. The Cryoboralfs are severely eroded and many slopes contain gullies. Vegetation is aspen-shrub, aspen-forb, and mountain shrub types on the south slopes and conifer, aspen-conifer, and high elevational shrub types on the north slopes.

Association 140

This association consists of about 50 percent Typic Cryoborolls, 25 percent Argic Cryoborolls, 20 percent Cryoboralfs and 5 percent Rock outcrops.

Typic Cryoborolls are moderately deep to deep with dark silt loam to gravelly or stony fine sandy loam surface layers and stony subsoils.

Argic Cryoborolls have surface horizons 4 to 8 inches thick in the shrub types and 10 to 15 inches thick in the aspen type. Surface texture varies from very fine sandy loams to silt loams. Subsoils are generally clay loams and depth to bedrock ranges from 3 to 5 feet.

Cryoboralfs have gravelly to stony fine sandy loam surface horizons from 10 to 15 inches thick. Subsoils are generally sandy loams to loams and depth to bedrock ranges from 3 to 4 feet.

The bedrock in this association is dominantly limy sandstone and shale (North Horn formation) but the soils have been strongly influenced by Flagstaff limestone colluvium. Elevations range from 7,500 to 8,500 feet. These soils are formed on very steep canyon slopes with gradients ranging from 50 to 60 percent on all aspects. The annual precipitation is 18 to 22 inches. Slight to moderate erosion is apparent under brush vegetation. Conifers occur in relatively pure stands on about 50 percent of the area with mixed aspen and conifer on about 25 percent of the area. The remainder is occupied by aspen and brush types. The brush types are found primarily on the south aspects.

Association 141

This association consists of Typic Cryoborolls and Calcic Cryoborolls which occur on about 80 percent of the area and Rock outcrop and Talus slopes which occur on about 20 percent of the area.

The Typic Cryoborolls have a 10 to 20 inch silt loam surface horizon and strongly calcic, gravelly or stony colluvial substrata layers.

These soils occur at elevations between 8,500 and 10,000 feet at the heads of Manti and Ephraim Canyons in the Flagstaff limestone formation. Slope gradients of the canyon sides range from 50 to 70 percent and the canyon bottoms and lower slopes range from 15 to 35 percent. The annual precipitation is about 30 inches. Erosion is moderate on many of the shrub-forb covered south slopes. Vegetation on the Typic Cryoborolls is dominantly of the tall-forb type. Vegetation on the south and west slopes on the Calcic Cryoboroll soils is dominantly a brush-forb type. Conifer is the dominant type on the north slopes which comprise about one-third of the area. The soils under conifer cover have surface layers of high organic content.

Association 142

This association consists of about 65 percent Argic Cryoborolls and 35 percent Typic Cryoborolls.

Argic Cryoborolls are well to somewhat poorly drained deep soils with 10 to 16 inch medium to moderately fine textured subsoils overlying stony moderately fine textured substrata.

Typic Cryoborolls are generally deep medium textured stony soils with weathered bedrock at 5 feet or more.

This association is a landslide area located in the North Horn formation. Slopes are 10 to 20 percent and the relief is hummocky and typical of slump and landflow topography. Annual precipitation is about 25 inches. Vegetation on this association is aspen with minor amounts of conifer and ground cover mixture of shrubs, forbs and grasses. Boggy areas are common and erosion is slight.

Association 143

This association consists of Typic Cryoborolls and Cryoboralfs along with minor areas of other soils.

The soils are very deep, well drained, and stony. Surface textures are dominantly very fine sandy loam and subsoils range from heavy loams to clay loams.

This association occurs in an undifferentiated group of glacial soils in canyon bottoms and cirque or slump basins. Annual precipitation ranges from 22 to 28 inches. Erosion was not observed in this area. These soils support conifer, aspen, and forb-shrub type vegetation.

Association 144

This association consists of 50 percent Pachic Cryoborolls, 25 percent Typic Cryoborolls, 15 percent Argic Cryoborolls, and 10 percent Lithic Cryoborolls.

Pachic Cryoborolls are deep with 16 to 25 inch dark colored silt loam surface horizons overlying thick to thin gravelly to stony unconsolidated limy subsoils resting on fractured limestone bedrock. Depth to bedrock is generally between 3 and 5 feet.

Typic Cryoborolls have 5 to 10 inch dark silt loam to very fine sandy loam surface horizons and light grayish, gravelly to stony, strongly limy silt loam subsoils. Depth to bedrock is generally about 3 feet.

Argic Cryoborolls have moderately thick to thick dark colored, very fine sandy loam to silt loam surface horizons; 6 to 18 inches somewhat mottled, sandy clay loam to clay loam subsoils (B horizons) and strongly limy substrata which are generally thicker than 5 feet. In places the bedrock is highly weathered limy siltstone, but in most places is limestone.

Lithic Cryoborolls have 4 to 8 inch dark colored, silt loam surface horizons overlying fractured limestone bedrock.

These soils are forming in materials from limestone (Flagstaff formation) at elevations generally above 10,000 feet south of the ridge above Hell Hole. These soils occur on gently sloping glaciated plateau remnants, gently sloping glacial basins, and moderately steep glacial troughs with slope gradients between 15 and 25 percent. Annual precipitation is 30 to 40 inches. Most of this association is slightly to moderately eroded. Vegetation is dominantly a forb-brush type consisting of herbaceous sage (*Artemisia discolor*), low sage (*Artemisia Rothrockii*), current, elderberry, and numerous forbs, grasses, and sedges. Conifers occur in widely scattered clumps.

Association 145

This association consists of about 40 percent Chromoxererts, 30 percent Argic Cryoborolls, and 30 percent Lithic and Typic Cryoborolls.

Chromoxererts under sagebrush are usually 18 inches to 3 feet deep to bedrock with 4 to 10 inch silty clay loam surfaces and stony clay loam to clay subsoils. Under aspen they are 3 to 5 feet deep to bedrock with 12 to 24 inch silt loam surfaces and silty clay loam subsoils.

Argic Cryoborolls have 10 to 20 inch dark silt loam surfaces over silty clay loam to clay loam subsoils. Depth to bedrock ranges from 3 to 4 feet.

Lithic and Typic Cryoborolls have 4 to 10 inch dark silt loam surfaces overlying fractured limestone bedrock or thick subsoils of highly limy gravelly or stony silt loams.

These soils occupy low broad ridgetops and upper slopes, mainly in the Flagstaff limestone formation, at about 9,000 feet elevation. Slope gradients are dominantly from 5 to 15 percent on the ridgetops and 15 to 35 percent on the upper slopes. Annual precipitation is from 25 to 30 inches. Vegetation is dominantly aspen-forb on the upper slopes and low sagebrush-grass-forb type on the ridgetops. Aspen-forb vegetation is dominant on the Argic Cryoborolls. This association is located on the ridge running north and south where Utah Highway 30 crosses the divide at the head of Cottonwood Creek.

Association 146

This association consists of 60 percent Calcic Cryoborolls, 25 percent Cryaquolls, and 15 percent Argic Cryoborolls.

Calcic Cryoborolls and Argic Cryoborolls are generally less than 3 feet to strongly limy, gravelly to stony silt loam to silty clay loam subsoils.

The Cryaquolls are deep with dark colored fine sandy loam to silt loam surfaces.

The Calcic Cryoborolls and Argic Cryoborolls occur mainly on the convex portion of the dissected pediplanes (rock floored plains) on valley sides. The Cryaquolls occupy draws, drainageways, and some concave slopes. Elevation is about 9,000 feet and annual precipitation about 25 inches. Vegetation on the Calcic Cryoborolls and Argic Cryoborolls is mainly a sage-grass-forb mixture. The Cryaquolls support sedges and grasses. These soils occupy large areas of meadow lands.

Association 147

This association consists of 40 percent Typic Cryoborolls, 30 percent Pachic Cryoborolls, 25 percent Argic Cryoborolls and 5 percent Lithic Cryoborolls.

Typic and Pachic Cryoborolls forming under conifers have a thin silt loam surface horizon generally less than 10 inches thick overlying gravelly silt loam to loam subsoils. Depth to bedrock is unknown, but is probably greater than 10 feet in most places. Under aspen these soils have 10 to 20 inch thick surface horizons. Some Typic Cryoborolls may be less than 3 feet deep to bedrock and are stony or gravelly throughout their profiles and occur on the steep conifer-covered north and west scarp slopes.

Argic Cryoborolls have a 6 to 12 inch medium to moderately fine textured surface horizon and a 18 to 30 inch moderately fine to fine textured subsoil overlying moderately fine textured substrata. Depth to weathered sandstone bedrock is generally greater than 6 feet.

Lithic Cryoborolls have thin medium textured surface layers and subsoils and are dominantly less than 3 feet to bedrock. They are stony or gravelly throughout their profiles.

This association occurs on a landslide area in the Flagstaff limestone formation but in places intermixed with materials of sandstone and shale. Elevations range from 9,000 to 12,000 feet. These

soils occur mostly on north and west slopes with gradients of 20 to 45 percent except on slump or fault scarps where gradients are 45 to 70 percent. Annual precipitation is 16 to 30 inches. Vegetation is primarily conifer and aspen on the Typic and Pachic Cryoborolls and aspen mixed with conifer at the upper elevations and oakbrush at lower elevations on the Argic Cryoborolls. Imperfectly drained meadows are common.

Association 148

This association consists of 65 percent Typic Cryoborolls, 35 percent Argic Cryoborolls with inclusions of Lithic Cryoborolls and minor amounts of Cryoboralfs.

Typic Cryoborolls and Argic Cryoborolls are well to moderately well drained soils. Depth to sandstone or shale bedrock varies from 2 feet on the spur ridges to 6 feet or more in the swales with an average depth of 3 to 4 feet. Surface horizons are 6 to 16 inches thick and fine sandy loam to silt loam in texture. Subsoils (B horizons) are generally lacking, but where present are sandy clay loam to clay loam in texture, have bright colors, and may be as thick as 24 inches. In the swales and glacial basins, the subsoils (B horizons) may be mottled, indicating somewhat restricted internal drainage.

Typic Cryoborolls with inclusions of Cryoboralfs and Argic Cryoborolls range in depth from 2 to 5 feet but are generally about 3 feet to bedrock.

Rock outcrops are common but occupy less than 10 percent of the area.

These soils overlie materials of the North Horn formation (mainly Calcic sandstones, shales, or mudstones). The association occurs on ridges and upper slopes at elevations from 8,500 to 10,000 feet. Typic Cryoborolls and Argic Cryoborolls occur on the ridges, swales, and glacial basins of the main north-south ridge with slope gradients of 10 to 30 percent. Erosion is moderate to severe. Typic Cryoborolls occur on steep upper slopes, mostly on south aspects with slope gradients of 50 to 60 percent. Past erosion has been severe. Annual precipitation is about 30 inches. Vegetation is dominantly shrub types consisting of current, sagebrush, elderberry, and other shrub species and many kinds of forbs and grasses. Scattered conifers are also present.

Association 149

This association consists of about 50 percent Argixerolls and 50 percent Haploxerolls intermixed.

These soils are moderately deep to deep and are medium to moderately fine textured with depth to bedrock generally from 2 to 6 feet with an average of about 3 feet. Surface horizons are 4 to 10 inches thick but may be up to 16 inches thick on lower slopes and in swales. The thinner surface horizons are generally on the steeper slopes. Some surface horizons are calcic. Subsoils (B horizons) in Argixerolls are generally 4 to 12 inches thick and are gravelly to cobbly silty clay loams. All the soils have a 6 to 30 inch lime-enriched horizon which is gravelly to stony, fine sandy loam to silt loam.

This association is forming in a graben remnant which has parent material derived from mixed rocks (the North Horn calcic mudstones and fine grained sandstones as well as the Flagstaff limestones). Elevations are between 7,000 and 8,000 feet. Slope gradients are mostly between 15 to 35 percent. Annual precipitation is between 14 and 18 inches. Erosion in this area is slight to moderate. Vegetation is mainly mountain shrub (oakbrush, mountain mahogany, sagebrush and juniper) with a mixed grass-forb understory.

Association 150

This association consists of about 60 percent Calcixerolls, 20 percent Argixerolls and 20 percent Lithic Haploxerolls with some Rock outcrops.

The Calcixerolls mostly occur on the lower slopes and swales, and have a 4 to 10 inch surface horizon with very gravelly to stony limy substrata and are 3 to 5 feet to bedrock.

The Argixerolls have 4 to 10 inch loam to silt loam textured surface horizons, 6 to 12 inch loam to silty clay loam limy subsoil horizons which may be gravelly and very gravelly to stony or shaly strongly limy substrata. Depth to bedrock is generally 4 to 6 feet on the deeper soils and less than 2 feet on the shallow soils. Much of the surface horizon has been removed by erosion on the steep, south-facing scarp slopes.

The Lithic Haploxerolls occur on the severely eroded steep dip and scarp slopes. Depth to bedrock ranges from less than 1 to 3 feet.

This association is forming in residuum derived from limy sandstones, shales and mudstones of the North Horn formation at elevations between 7,000 and 8,000 feet. Average annual precipitation is 12 to 16 inches. Erosion is severe. Vegetation is pinyon-

juniper on the steep dip and scarp south-facing slopes with mixtures of mountain mahogany, sagebrush and Mormon tea. Oakbrush mixed with sagebrush and mountain mahogany occurs in swales and on lower north-facing slopes.

Association 151

This association consists of about 50 percent Haploxerolls, 30 percent Argixerolls, and 20 percent Lithic Haploxerolls.

The Haploxerolls are generally 2 to 5 feet deep to bedrock. They generally have 6 to 12 inch dark gravelly loam to silt loam surface horizons and very gravelly or stony very limy substrata. The entire profile may be limy.

The Argixerolls are generally 2 to 5 feet deep over bedrock with 6 to 12 inch dark gravelly loam to silt loam surface horizons and very gravelly to stony silt loam to silty clay loam subsoil horizons and very stony or gravelly very limy substrata. The entire profile may be limy.

The Lithic Haploxerolls are found on the steeper upper slopes and are generally less than 2 feet to very stony substrata or bedrock. In places much of the silt loam surface horizon has been eroded.

These soils are forming on the subdued ridges and upper mountain slopes in residuum derived from limy sandstones, shales and mudstones of the North Horn formation at about 8,000 feet elevation. Slope gradients of the ridges range from 10 to 25 percent and of the upper mountain slopes from 25 to 35 percent. The average precipitation is about 20 inches. Vegetation is mainly a mixed mountain shrub-grass type with oakbrush and big sagebrush plus some serviceberry, rabbitbrush, chokecherry, rose, Oregon grape, and numerous forbs and grasses.

Association 152

This association consists of about 50 percent Typic Cryoborolls, 25 percent Cryoboralfs, and 25 percent Argic Cryoborolls.

Typic Cryoborolls are forming under conifer with light colored 18 to 24 inch gravelly loam to sandy loam surface horizons. Subsoils are mostly very gravelly sandy loam to loamy sands. Depth to bedrock is from 3 to 6 feet. Soils under shrub vegetation are moderately eroded.

Cryoboralfs are similar to the Typic Cryoborolls but have weak, thick, light colored mixed surface and subsoil (A and B) horizons of very fine sandy loam to loam texture.

Argic Cryoborolls have dark 8 to 16 inch loamy surface horizons and reddish, heavy loam to sandy clay loam subsoils. Depth to bedrock is about 3 to 5 feet.

This association is forming in material from Conglomerate rocks (Indianola formation) at elevations between 8,000 and 9,500 feet on north and east slopes that range between 35 and 55 percent in gradient. Precipitation is about 25 inches. Vegetation consists of conifer, aspen and mountain shrubs.

Association 153

This association consists of about 50 percent Haploxerolls, 35 percent Argixerolls and 15 percent Rock outcrops.

Haploxerolls are generally less than 30 inches deep with 5 to 10 inch gravelly sandy loam surfaces, very gravelly loamy sand subsoils overlying massive conglomerates.

Argixerolls have gravelly sandy loam, 5 to 10 inch surface horizons, 18 inch very gravelly sandy loam subsoils and 1 to 2 feet reddish, very gravelly sandy clay loam substrata overlying massive conglomerate bedrock at 3 to 5 feet.

These soils are forming over the Indianola conglomerate at elevations between 7,000 and 8,000 feet. Annual precipitation is from 14 to 18 inches. Erosion is moderate. Vegetation consists of sagebrush, juniper, pinyon pine, and mountain mahogany.

Association 154

This association consists of about 65 percent Lithic Haploxerolls, 30 percent Argixerolls and 5 percent Rock outcrops.

Lithic Haploxerolls are in the upland shallow loam range site.

Argixerolls occur in the upland stony loam range site. They are moderately deep clay loams with fractured limestone over bedrock.

These soils are formed in material derived from limestone, sandstone and shale from the Flagstaff formation. Because of this limy parent material, little development has taken place in any of these soils. Elevations range from 5,800 to 6,800 feet. This

association occurs on all aspects except north. The Lithic Haploxerolls occur mainly on south and west exposures. Precipitation ranges from 12 to 14 inches. Slopes range from 30 to 60 percent, dominantly about 45 percent. Erosion is a serious hazard in the Lithic Haploxerolls, particularly during thunderstorms and to some degree during spring runoff. Erosion is slight to moderate in the Argixerolls. Vegetation consists mainly of mountain mahogany, juniper, pinyon, oakbrush, big sagebrush, squawapple, bluebunch wheatgrass, and Indian ricegrass. Vegetative cover is in poor condition.

Association 155

This association consists of about 50 percent Lithic Torriorthents, 40 percent Haplargids, and 10 percent Rock outcrops.

Lithic Torriorthents occupy all aspects. These soils hold less than 2 inches of water and they are readily susceptible to erosion.

Haplargids occur on all exposures and are 18 to 30 inches deep over bedrock. The soil consists mainly of fractured limestone and shale. Water-holding capacity is $2\frac{1}{2}$ to 5 inches. This soil is very erosive.

This association is forming primarily in material from Flagstaff limestone at elevations of 5,500 to 6,000 feet. Slopes average 35 percent. Annual precipitation is 9 to 12 inches. Vegetation consists of juniper, big sagebrush, yellowbrush, Indian ricegrass, and bluebunch wheatgrass.

Association 156

This association consists of about 75 percent Argixerolls, 20 percent Lithic Haploxerolls, and 5 percent Rock outcrops.

Argixerolls are stony with limestone and shale fragments throughout. This soil is about 30 inches deep over bedrock, but as much as 60 inches deep on north exposures and in canyon draws. They have a water-holding capacity of 4 to 8 inches. Erosion is slight to moderate.

Lithic Haploxerolls are shallow and stony with fractured limestone and shale fragments. They hold less than two inches of water and are very erosive.

This association is forming in material from Flagstaff limestone. Because of highly calcareous sedimentary rock, no distinct "B" horizons have formed, but good surface "A" horizons are present. Elevations are from 6,500 to 8,000 feet. Slopes range from 20 to

60 percent, mainly 35 to 40 percent. Precipitation is 14 to 18 inches. Vegetation is mainly oakbrush, birchleaf mountain mahogany, squawapple, snowberry, chokecherry, serviceberry, big sagebrush, bluebunch wheatgrass, and Indian ricegrass. Some aspen and conifers are present. Range is in poor condition.

Association 157

This association consists of Rock outcrops.

Association 201

This association consists of Torrifuvents and a small percent of Calciorthids. The Torrifuvents are deep, 80% medium-moderately fine, 15% moderately coarse and 5% fine textured soils that are well drained. Calciorthids are medium textured, well drained with some gravel at 20 to 30 inches deep.

The soils in this association occur on long alluvial fans and flood plains on slopes of 1 to 6%. Exposure is east and west. Precipitation ranges between 9 to 12 inches. Elevations range from 5,000 to 6,000 feet in upper Sevier Basin and 4,800 to 5,500 feet in the lower Basin. Erosion is slight to moderate. The available water-holding capacity for a 5-foot profile ranges from 8 to 11 inches for the Torrifuvents, and 6 to 9 inches for the Calciorthids.

These soils are in land capability class and subclass IIc (15%), IIe (60%), IIs (10%), IIIe (10%), IIIs and IVs (5%).

These soils are used for irrigated cropland.

Association 202

Soils included in this association are Haplaquolls, Calciquolls and Haplaquepts. They occupy alluvial valley bottoms and flood plains. They are derived from mixed sedimentary and igneous parent rock and range from sandy loams to clays in texture and from moderately deep to deep.

They occur on slopes of 0 to 3 percent at elevations ranging from 4,600 to 5,000 feet in Millard County, 5,000 to 6,000 feet in Sevier, Sanpete and Juab Counties and 6,000 to 7,000 feet in Piute and Garfield Counties. The average annual precipitation ranges from 7 to 12 inches. These soils are somewhat poorly drained and contain slight to strong concentrations of saline salts. The vegetative cover is primarily saltgrass, wiregrass, sedges and annual weeds.

These soils will hold about 10 inches of available water in a 5-foot root-zone. However, there is a minor amount of Histosolls which will hold substantially more. Erosion is negligible; however, detrimental deposition is a problem in some areas.

This association occurs in the "Salt meadow" (15%), and "Wet meadow" (85%), range sites. Capability subclasses are IIw (15%), IIIw (40%), IVw (40%), and Vw (5%).

Association 203

Soils within this association consist of about 70 to 80% Natrargids, and 20 to 30% Calciorthids and Torrifuvents. They occupy old alluvial fans and flood plains. These soils are generally derived from mixed sedimentary and quartzite parent rock. The soils are generally deep, medium to fine textured and exhibit a strong B2 horizon with a high sodium content. Permeability is very slow. A small amount of this association may contain deep, gravelly Torrifuvent or Torriorthent soils.

The soils of this association occur at elevations ranging from 4,600 to 5,800 feet, on slopes of 1 to 10 percent. The average precipitation ranges from 7 to 12 inches annually. Vegetative cover is predominantly greasewood, but includes shadscale and big sagebrush as well as cheatgrass and small hordeum.

The Natrargids and Calciorthids hold from 8 to 10 inches of water. The deep gravelly soils hold about 3 to 5 inches of available water to a depth of 5 feet.

The soils in this association are in the "Semi-desert alkali flat" (70%), "Semi-desert loam" (5%), and "Semi-desert limy loam" (25%) range sites. Capability class and subclass included are IIe (3%), IIw (1%), IIIe (15%), IVe (6%), IVs (5%), and VIIs (70%).

Association 204

This association consists of about 60% Argixerolls, 20% Haploxerolls, and 20% Calcixerolls. The Argixerolls consist of deep, well drained soils with dominantly medium to fine textured profiles with strong lime horizons at depths of 15 to 30 inches. Parts of the area (20%), mainly in Sanpete County, have stones or boulders in the profile. The Haploxerolls are deep, medium or moderately-fine textured soils. The Calcixerolls are moderately-coarse or medium textured with stony lime horizons within 10 to 20 inches of the surface.

These soils occur on slopes of 1 to 10% and are located in the northwest part of Sanpete County and eastern Juab County. Precipitation ranges from 12 to 16 inches. Elevations are from 4,900 in Juab County to 6,000 feet in Sanpete County. Erosion is slight to moderate. The available water-holding capacity to a depth of 5 feet is 9 to 11 inches for the soils without stones or boulders in the profile and 5 to 8 inches with the coarse fragments. Vegetation is wheatgrass, big sagebrush and bitterbrush.

Land capability class and subclass IIIc, IVc and VI are nonirrigated. Upland loam, upland stony loam and upland limy loam range sites are included. These soils are used mainly for dryland farming.

Association 205

This association consists of about 30% Haplargids, 35% Calciorthids, 20% Lithic Torriorthents, and 15% Inclusions of shale hills, rock outcrop, Torrifuvents and Natrargids.

Parent material is colluvium, residuum, or alluvium from sedimentary and igneous rocks. Some localized areas have parent material predominantly from sedimentary or igneous rock.

This is a mountainous area and the soils are forming on steep mountain slopes, rolling hills, dissected plateaus, and colluvial cones. The soils range from deep, with varying amounts of gravel or stone, to shallow over bedrock or rock outcrop. The Haplargids, Calciorthids, and Torrifuvents are deep, well drained, with moderately-fine and medium textured profiles. The Lithic Torriorthents have light colored surface (A1) horizons, are limy throughout, and are shallow (4 to 15 inches) over bedrock. In localized areas, the parent rock greatly influences the soil color and mineralogy.

Elevation is from 5,000 to 6,800 feet. Slopes are from 10 to 70 percent, but predominantly 20 to 50 percent. Erosion is slight to moderate with deep gullies cutting in some intermittent stream channels. The average annual precipitation of 6 to 11 inches is fairly evenly distributed throughout the year.

Vegetation is black sagebrush, big sagebrush, yellowbrush, little rabbitbrush, squirreltail grass, Indian ricegrass, spike wheatgrass, buckwheat, bud sage, greasewood, shadscale, juniper, and pinyon.

The available water-holding capacity for the deep soils is 8 to 11 inches; the shallow soils retain less than 3 inches.

Range sites are semi-desert loam, limy loam, gravelly loam, and shallow loam.

Association 206

These soils are comprised principally of low lying recent alluvium. They lie in a transition zone between the Argixeroll and the Haplargid great soil groups. These soils are usually deep, medium to fine textured except some areas are underlain by a hardpan. They are generally imperfectly to poorly drained. Although this condition exists, it appears the water moves so rapidly that there is no accumulation of detrimental saline salts. Organic matter content is generally high.

Erosion is negligible and detrimental deposition is not a serious problem. These soils occur on slopes of 0 to 2 percent. Natural vegetation is primarily wiregrass and sedges.

Capability class and subclass included in this association are IIw (10%), IIIw (75%) which have an available water-holding capacity of 10 inches in a 5-foot root-zone, and IVw (15%) which holds 3 to 6 inches of water depending on the effective soil depth to hardpan. These latter capabilities are associated with soils of 15 to 30 inches depth over hardpan.

Association 207

This association consists of about 60% Argixeroll, 30% Calcixeroll and 10% Haploxeroll soils. About half the Argixerolls are deep, moderately-fine to fine textured soils; the other half are stony or bouldery soils; strong lime horizons generally occur at 12 to 25 inches. The Calcixerolls are gravelly soils with medium to moderately-fine texture, and strong lime horizons occur at shallow depth; some are cemented. The Haploxerolls are deep, medium or moderately-fine textured.

These soils occur at elevations of 5,000 to 6,500 feet in Sanpete and Juab Counties. Slopes range from 1 to 10%, mainly 1 to 6%. Precipitation ranges from 12 to 14 inches. Available water-holding capacity to a depth of 5 feet is 9 to 11 inches for the soils without coarse fragments and 4 to 8 inches for those with coarse fragments.

Erosion is slight to moderate. Native vegetation is big sagebrush, pinyon, juniper, wheatgrasses, Indian ricegrass, and bitterbrush.

Land capability class and subclass are IIe to IVe irrigated and IVc to VIc nonirrigated. Range sites are upland loam (40%), upland stony loam (30%), upland gravelly loam (20%), and upland shallow hardpan (10%).

These soils are used mainly for dry and irrigated cropland.

Association 208

This association consists of about 75% Argixerolls, 20% Lithic Haploxerolls, Xerorthents, and Calcixerolls and 5% deep Haploxerolls; derived from sandstone, limestone and shale.

The Argixerolls consist of deep soils with medium textured surfaces and moderately-fine or fine textured B2 horizons. About 40% of these soils have 20 to 40% cobbles in the surface and throughout the profile; some have strong lime horizons, some do not. These soils occur on upland benches and slightly rolling hills on slopes of 3 to 6%. The Lithic Haploxerolls, Xerorthents, and Calcixerolls occur in narrow canyons and steep breaks on slopes of 20 to 50%. The soils are

medium textured and stony or cobbly or shallow over bedrock with some rock outcrops. The Haploxerolls occur in narrow valleys that are usually gullied. These soils are deep, medium textured. The slopes are 1 to 6%.

Elevations vary from 7,000 to 8,000 feet and precipitation ranges from 11 to 16 inches. Vegetation consists of big sagebrush, black sagebrush, scattered oakbrush, bitterbrush, wheatgrasses, with pinyon and juniper found in the rough, steep areas.

Available water-holding capacity for the Argixerolls will range from 6 to 10 inches in a 5-foot profile depending on the amount of cobbles in the profile. The Haploxerolls will hold 10 inches and the soils in the rough broken areas will hold 2 to 6 inches.

Range sites are upland loam, gravelly loam and shallow loam.

Association 209

This mapping unit comprises an association of deep and moderately-deep, fine and moderately-fine textured Argixerolls, Lithic Haploxerolls, and Rock outcrops. They are formed primarily in the Green River geologic formation which consists mainly of blue-gray to light blue shale and a cream to tan limestone. Thin beds of sandstone and siltstone also occur.

The Argixerolls comprise 80 to 85%, the Lithic Haploxerolls 15 to 20%, and Rock outcrops 1 to 5% of this association unit.

The Argixerolls occur in both alluvium and residuum and are found on all exposures alike. They are generally stone free, deep and moderately-deep clay and clay loam soils over shale. There is little development of a "B" horizon but strong lime horizons are present. These soils have an available water-holding capacity of 6 to 10 inches, for a depth of 5 feet. Sheet and gully erosion is moderate to severe during summer thunderstorms. Gully erosion is also a serious problem during spring runoff.

The Lithic Haploxerolls have thin mantles of soil over limestone and shale bedrock. They are generally severely eroded and gravelly or flaggy on the surface. They have an available water-holding capacity of less than 2 inches. They exhibit a high susceptibility to erosion, but likely do not contribute a great deal of sediment.

The Argixerolls occur in the upland loam range site; the Lithic Haploxerolls occur in the upland shallow loam. They are mostly in poor condition. The vegetative cover consists mainly of big sagebrush, juniper, shadscale, birchleaf mountainmahogany, bitterbrush, bluebunch wheatgrass, western wheatgrass, and Indian ricegrass. The potential production is much less on the Lithic Haploxerolls than on the Argixerolls.

These soils are developing under an annual precipitation of 12 to 16 inches.

They occur on hills on slopes of 8 to 50% but are dominantly 15 to 25%. Elevation ranges from 5,600 to 7,200 feet. The dry cropland is in a IVe capability class and subclass.

About 30% of this unit is used for dry cropland scattered interspersely throughout; the remainder as range pasture.

Association 210

This mapping unit is an association of shallow to moderately-deep, moderately-fine textured Argixerolls, Lithic Haploxerolls and Rock outcrops. These are formed principally in the North Horn geologic formation consisting of sandstone, varigated shales, conglomerates and limestone.

This unit is comprised of about 70 percent Argixerolls, 20 to 25% Lithic Haploxerolls and 5 to 10% Rock outcrop.

The Argixerolls occur on all exposures, but occur least on the south aspects. They are generally stony and are not usually deeper than 40 inches over bedrock. They are dominantly sandy clay loams to clay loams depending on the parent material. The B horizon is a heavy clay loam ranging to a clay and is generally underlain with a strong Ca horizon which is occasionally weakly cemented. They have an available water-holding capacity of 5 to 8 inches. Erosion from flash thunderstorms is a common problem and much rock and sediment has been carried to the valleys down the steep slopes.

The Lithic Haploxerolls, dominantly occurring on the south exposures, are very stony with only a thin mantle of soil over bedrock. They are very susceptible to erosion and most soil is found in and around a clump of grass or a bush. These soils have less than 2 inches available water-holding capacity.

They are developing in a climate of 12 to 15 inches precipitation annually. Slopes range from 25 to 65 percent, but are dominantly about 45 percent. Elevations range from 6,000 to 8,000 feet. These soils occur in Sanpete and Juab Counties.

The land is generally in poor condition. The Lithic Haploxerolls have much less potential than the Argixerolls, although Lithic Haploxerolls have fair vegetation because they are less accessible to livestock. The vegetative cover is mainly big sagebrush, oakbrush, pinyon, juniper, bitterbrush, birchleaf mahogany, squawapple, bluebunch wheatgrass, needlegrass and Indian ricegrass.

Range sites are upland stony hills (50%), upland loam (30%), upland stony loam (15%). Rock outcrops class VIII (5%) does not carry a range site name.

Association 211

This association consists of 40% Xerorthents, 50% Lithic Haploxerolls and Rock outcrops and 10% Calcixerolls derived from limestone, sandstone and shale. The Xerorthents consist of moderately-deep to deep, moderately-fine to moderately-coarse cobbly soils, showing very little soil development. In some locations, partly weathered soil material is found. These soils range from 40 to 70% cobbles.

The Lithic Haploxerolls have from a few inches up to about 12 inches of soil over bedrock. The Calcixerolls are similar to Xerorthents except they have strong lime horizons. There are some small areas with deep Argixeroll soils and small alluvial valleys.

The topography is steep to very steep hills on slopes of 20 to 70%, mostly from 30 to 50% on all exposures. The elevations range from 5,200 to 7,600 feet. Precipitation ranges from 12 to 15 inches. The area is moderately eroded. The vegetation consists of juniper, pinyon, birchleaf mahogany, oakbrush, big sagebrush, squawapple, snakeweed, bluebunch wheatgrass and Indian ricegrass.

Available water-holding capacity will range from 4 to 7 inches in a 5-foot profile in the Xerorthents and Calcixerolls, to less than 2 inches in the Lithic Haploxerolls. The range sites are upland stony loam, upland limy loam, and upland shallow loam.

Association 212

This mapping unit is an association of shallow, moderately-deep, and deep Argixerolls, Lithic Haploxerolls, and Rock outcrops. They are medium to fine in texture. These soils are formed mainly in pyroclastic rocks which include both basic and acid igneous and quartzitic rocks. About 45% of this unit has a covering of stones on the surface. The Argixerolls comprise approximately 65% of this unit, the Lithic Haploxerolls 25% and Rock outcrops 10%.

The Argixerolls occur on all aspects but seem to be much less common on the south exposures. About 45 to 50 percent is covered with stones on the surface. The subsoils are heavy clay loams to clay and are generally stone free to about 30 inches. The "B" horizons are well developed and the presence of a strong lime horizon varies with the parent rock. They have an available water-holding capacity of 4 to 10 inches for a depth of 5 feet.

The Lithic Haploxerolls occur on all exposures but likely predominate on the south. These soils have far less development, are much more susceptible to erosion and commonly have an erosion pavement. However, they do not likely contribute a great deal of sediment. The available water-holding capacity to a depth of 5 feet is less than 2 inches in the shallow soils, and 5 to 10 inches in the deep and moderately-deep soils.

The soils in this unit are formed under 14 to 16 inches of precipitation annually. They occur on slopes of 5 to 60 percent but are mainly on slopes of 30 to 35 percent. Elevations range from 6,000 to 7,500 feet. The susceptibility to erosion is moderate. However, there is a pebble pavement on a great deal of this land.

Range sites are upland loam, shallow loam, and stony hills. They are presently in poor condition. The vegetative cover is big sagebrush, bitterbrush, oakbrush, serviceberry, juniper, bluebunch wheatgrass, western wheatgrass, and Indian ricegrass.

Association 213

This association consists of about 60% Lithic Torriorthents and Rock outcrops, 40% extremely stony or very cobbly Torriorthents and Calciorthids derived from sedimentary and/or igneous parent material.

The Lithic Torriorthents have 5 to 10 inches of stony or cobbly medium textured soils over bedrock. The Torriorthents and Calciorthids have 30 to 80% cobbles or stones with a medium or moderately-coarse textured soil; the Calciorthids have a strong lime horizon. Shale outcrops are common in Juab County.

This association occurs on moderately-steep to very steep hills and rough, broken mountain slopes at slopes of 10 to 70%; some of the Rock outcrops form cliffs.

Erosion is mainly geologic; the runoff is rapid. Elevations range from 5,400 to 7,500 feet and precipitation ranges from 7 to 14 inches. Vegetation consists of a very sparse cover of shadscale, Indian ricegrass, snakeweed, cheatgrass, Russian thistle, juniper, bluebunch wheatgrass, and big sagebrush.

Available water-holding capacity is about $\frac{1}{2}$ to $1\frac{1}{2}$ inches in the Lithic Torriorthents, 3 to 5 inches in the Calciorthids and Torriorthents in a 5-foot profile.

Range sites are semi-desert shallow loam, semi-desert stony loam and limy loam, with large areas of wasteland.

Included in this mapping unit are a few small areas of Argixerolls and a few small valleys with deep Haploxerolls.

Association 214

This association consists of 70 to 75% Argixerolls, Haploxerolls and Argic Cryoborolls, 15 to 20% Lithic Haploxerolls and 10% Rock outcrops. They are formed principally from sandstone, shales, conglomerates, and limestone.

The Argixerolls and Argic Cryoborolls are on a north and west facing aspect with north and south micro-exposures. They are stony or cobbly, moderately-deep clay loam and clay-type soils. Some have well developed "B2t" horizons and strong lime horizons. In the Haploxerolls, the parent material is so high in lime that complete leaching of lime has not occurred and "B2t" horizons have not developed. The coarse fragments in the profile are usually flat limestone fragments. Approximately 10% of the area is free of stone or cobble in the first two feet of profile. These soils have an available water-holding capacity of 5 to 9 inches for a depth of 5 feet. The Lithic Haploxerolls have a very thin soil mantle over bedrock on all exposures except east. They have an available water-holding capacity of less than 2 inches.

They are developing in a climate of 15 to 20 inches precipitation annually, occur on slopes ranging from 10 to 70% but are dominantly 10 to 35 percent. They occur at elevations ranging from 6,600 to 8,500 feet. Erosion is a constant hazard due to the steep slopes and severity of flash thunderstorms.

The soils in this unit all occur in the mountain stony loam, mountain loam and mountain shallow loam range sites and are dominantly in poor condition. The vegetative cover comprises mainly chokecherry, elderberry, snowberry, big sagebrush, oak, bitterbrush, birchleaf mahogany, peavine, slender wheatgrass, bluebunch wheatgrass, needlegrass and mountain brome with some quaking aspen and conifer timber present in draws at the high elevations and north facing slopes.

Association 215

This association comprises moderately-deep, heavy loam and clay loam Haploxerolls, Lithic Haploxerolls and Rock outcrops. They are formed in the Flagstaff geologic formation consisting mainly of limestone, shale and chert fragments. Because of this highly calcareous sedimentary rock, no distinct "B" horizons have formed, but good "A" horizons are present.

Approximately 75% of the unit is comprised of Haploxerolls, 20% Lithic Haploxerolls and 5% Rock outcrops. The Haploxeroll soils are deeper and more developed on the north exposures, least common on the

south faces, but occur on all exposures. They are generally stony with flaggy limestone and shale fragments throughout. These soils are generally about 30 inches deep over bedrock, but are as much as 60 inches deep on north exposures and in canyon draws. They have an available water-holding capacity of 4 to 8 inches. Erosion is generally slight to moderate.

The Lithic Haploxerolls occur on all exposures but dominate the south faces. These soils are stony with fractured limestone and shale fragments. They hold less than 2 inches of available water, are very susceptible to erosion and are a source of sediment during spring runoff and heavy thunderstorms.

Precipitation ranges from 14 to 18 inches. Slopes range from 20 to 60% with about 35 to 40% dominating. Elevations range from 6,500 to 8,000 feet. The aspect is dominantly east on the west side and west on the east side of the valley.

These soils occur in the mountain stony loam and mountain shallow loam range site and are dominantly in poor condition. The vegetative cover is mainly oakbrush, birchleaf mahogany, squawapple, snowberry, chokecherry, serviceberry, big sagebrush, bluebunch wheatgrass and Indian ricegrass. Some quaking aspen and conifer timber is also present.

Association 216

This association consists of 50% Argic Cryoborolls, 30% Lithic Cryoborolls, and 20% Rock outcrops and are derived from sandstone, limestone, shale and igneous rocks. The Argic Cryoborolls are deep with medium textured surface soils and moderately-fine to fine textured B2t horizons. The Lithic Cryoborolls have a thin mantle (2-12") of soils over bedrock. These soils occur on north, north-west and east facing mountain slopes of 20 to 60%.

The elevations range from 8,000 to 8,600 feet. The area is slightly to moderately eroded. Precipitation is 16 to 20 inches. Available water-holding capacity ranges from 8 to 11 inches in the Argic Cryoborolls in a 5-foot profile to less than 2 inches in the Lithic Cryoborolls.

The vegetation consists of conifer and aspen trees in the draws; oak, bitterbrush, snowberry, spiked wheatgrass and bluegrasses on the remaining areas. The range sites are mountain loam and mountain shallow loam. The Rock outcrops are Class VIII.

Association 217

This association consists of well drained Argixerolls derived from basic igneous parent material. The soils have medium textured surfaces and moderately well to well developed clay loam or light clay subsoils (B2t horizons) underlain by a cobbly, medium textured (40-60% cobbles) soil with a strong lime horizon at depths of 15 to 20 inches. About 60% of the area has 30-50% cobbles on the surface and throughout the profile.

These soils occur on rolling bench lands and fans with general slopes of 2 to 5 percent to the east and short north and south slopes into the drainage ways of 5 to 20%.

The elevation ranges from about 7,000 to 7,900 feet. The area is slightly to moderately eroded. Precipitation is between 12 and 16 inches.

The vegetation consists of big sagebrush, black sagebrush, blue-grama grass, western wheatgrass, needleandthread grass, Lettermans needlegrass, native poa, scattered pinyon and juniper.

Available water-holding capacity for the soils free of coarse fragments through the A and B horizons is about 6 to 8 inches for a 5-foot depth and about 5 to 6 inches for the soils with coarse fragments throughout the profile. The range sites are upland limy loam, upland loam, and upland gravelly loam.

Association 218

This association consists of about 70% Torrifuvents and 30% Calciorthids derived from sandstone and limestone parent material.

The Torrifuvents are medium and moderately-fine textured with some moderately-coarse textured, deep, well drained soils. About 50% of the Calciorthids have 30 to 50% gravel occurring at a depth of 15 to 20 inches. The other 50% are deep medium to moderately-coarse textured and well drained with lime accumulation between 15 and 25 inches in depth.

The soils in this association occur on small hills, alluvial fans and flood plains on slopes of 2 to 5%. They are on northwest and west exposures. Elevation ranges from 5,500 to 6,000 feet in lower Sevier area and 7,000 to 7,300 feet in upper Sevier Basin area. Precipitation ranges between 9 and 12 inches. Erosion is slight to moderate. These soils are used mainly for dryland farming. The available water-holding capacity in the Torrifuvents and the nongravel Calciorthids ranges from about 8 to 10 inches in a 5-foot profile. The Calciorthids underlain by gravel will hold about 4 to 6 inches. Capability class and subclass are IVc, IVe, VIc, and VIs.

Association 219

This association consists of about 50% Torrifuvents and 50% Calciorthids derived from sedimentary parent material, mainly limestone and sandstone. The Torrifuvents are deep and range mainly from medium to moderately-fine textured; however, there are a few small areas of gravelly soils. They occur in small alluvial valleys on slopes of 1 to 6%. The Calciorthids are usually gravelly throughout, with a strong lime horizon that occurs between 10 and 20 inches, and in some locations the lime horizon is inundated. These soils are on alluvial fans and rolling bench land on slopes of 2 to 10%.

Elevations in the upper basin range from 6,800 to 7,300 feet, and from 5,200 to 6,400 feet in the lower basin.

Precipitation ranges from 10 to 13 inches. Erosion is slight to moderate. The vegetation consists of big sagebrush, black sagebrush, Indian ricegrass, cheatgrass, juniper and blue grama.

Available water-holding capacity in the Torrifuvents ranges from 10 to 12 inches in a 5-foot profile and from 3½ to 5 inches in the Calciorthids.

Range sites are semi-desert loam and semi-desert gravelly loam.

Association 220

This association consists of about 85% Argiborolls, Argic Cryoborolls and 15% Haploborolls derived from sedimentary parent material. The Argic Cryoborolls are on very steep north facing slopes, the Argiborolls are on very steep south facing slopes, and the Haploborolls occur in narrow alluvial valleys between the slopes. The Argiborolls and Argic Cryoborolls are extremely stony or very cobbly throughout (50 to 70% coarse fragments) with a medium textured surface and moderately-fine or fine textured B2t horizons. The slopes are from 30 to 70%. The Haploborolls are deep and medium textured on slopes of 2 to 5%, and are generally gullied.

Elevation ranges from 7,800 to 8,500 feet. Precipitation ranges from 15 to 20 inches.

The vegetation on the Argic Cryoborolls consists of timber in the draws and big sagebrush on the ridges with a small amount of grasses. The vegetation on the Argiborolls consists dominantly of pinyon, juniper and big sagebrush with a few grasses. The available water-holding capacity of the Argiborolls and Argic Cryoborolls is about 3 to 5 inches for a 5-foot soil profile. Haploborolls will hold about 10 inches of available water.

Range sites are mountain stony loam, upland stony loam and upland loam.

Association 221

This association consists of well drained Argiborolls, Haploborolls and Calciborolls derived from basic and intermediate igneous parent material. About 50% of the area is Argiborolls which are predominantly cobbly or stony with a medium textured surface soil (A) and a clay loam or clay B2t horizon underlain by a medium textured cobbly Cca horizon. Depth to the lime horizon ranges from 10 to 15 inches at the lower elevations and 24 to 30 inches at the higher elevations. There are some areas at higher elevations that are free from coarse fragments in the A and B horizons with a cobbly Cca at 24 to 30 inches; these soils comprise about 20% of the Argiborolls. The Calciborolls comprise about 25% of the area. They are medium textured with a strong lime zone at 10 to 20 inches and are cobbly or stony throughout. The Haploborolls occur in small valleys and comprise 10% of the area. These soils are deep and medium textured.

The cobbly or stony soils consist of about 30 to 60% coarse fragments. About 15% of the total area is Rock outcrops. These soils are on hills and small narrow valleys with slopes of 10 to 50%, more common 15 to 25%. These soils are found on all exposures.

The elevation ranges from 6,800 to 7,800 feet. The area is moderately to severely eroded. Precipitation is estimated at 10 to 18 inches.

The vegetation is mainly pinyon and juniper, with a small amount of big sagebrush, blue grama and a few forbs.

Available water-holding capacity will range from 5 to 8 inches in a 5-foot profile depending on the amount of coarse fragments.

The range sites are 25% upland gravelly loam (pinyon and juniper), 40% upland loam (pinyon and juniper), 20% upland loam, and 15% Rock outcrops which is class VIII and does not carry a range site name.

Association 222

This mapping unit consists of about 60% Calciustolls and Calcixerolls, 20% Argiustolls and Argixerolls, 15% Ustorthents and Xerorthents, and 5% Rock land, derived principally from basic igneous parent material in upper Sevier River and sedimentary material in the lower Basin.

The Calciustolls and Calcixerolls are usually medium textured throughout with some small areas having deep soils without coarse fragments. About 85% have 30 to 60% cobbles and some stones throughout the profile. There is a strong lime horizon between 10 and 20 inches.

About 70% of the Argiustolls and Argixerolls have 30 to 50% cobbles and some stones throughout the profile; about 30% are free of coarse fragments in the A horizons but have cobbles in the B and C horizons. Strong lime horizons usually occur between 15 and 24 inches. The A horizons are loams or cobbly loams, 5 to 10 inches thick, the Bt horizons are cobbly clay loams or cobbly light clays 5 to 20 inches thick, underlain by cobbly or very cobbly loams or sandy loams. The Ustorthents and Xerorthents are mixtures of various unconsolidated soil material, usually containing a considerable amount of coarse fragments.

The soils in this association are on hills and alluvial fans dominantly on slopes of 2 to 25% with some of the Ustorthents and Xerorthents on very steep slopes and narrow rocky canyons on slopes up to 70%. They are on all exposures. The Rock land is on very steep slopes and canyons. Elevations range from about 5,800 to 7,800 feet; precipitation ranges from about 9 to 15 inches; erosion is slight to moderate.

The vegetation on the hills and steep canyons is mainly pinyon and juniper with a small amount of grasses, forbs and shrubs such as Indian ricegrass, sand dropseed, western wheatgrass, squirrel-tail, pussytoes, woody aster, phlox and Brigham tea. The alluvial fans and other open areas have big sagebrush, black sagebrush, oak, bitterbrush, yellowbrush, tall native poa, Lettermans needlegrass, spiked wheatgrass; and the grasses and forbs mentioned with the pinyon and juniper areas above.

The available water-holding capacity in the Calciustolls, Calcixerolls, Argiustolls and Argixerolls range from about 5 to 10 inches in a 5-foot profile, depending on the amount of coarse fragments. The Ustorthents and Xerorthents will range from about 3 to 6 inches in a 5-foot profile.

The range sites are upland gravelly loam, upland stony loam, and upland loam.

Association 223

This mapping unit consists of about 80% Torrifluvents on benches and in small valleys and 20% Calciorthids on rolling hills. About two-thirds of the bench soils consist of deep medium and moderately-coarse textured soils; the other one-third are moderately-coarse and gravelly with gravel occurring at a depth from about 5 to 20 inches.

These soils are on slopes of about 3 to 6% with some small areas up to 20%. The Calciorthids are medium to moderately-coarse textured with 50 to 70% gravel at depths of 5 to 15 inches and strong lime horizons. These soils are on slopes of 5 to 15%. The soils in the small valleys are deep and medium textured on slopes of 2 to 5%. These soils are derived from mixed igneous and sedimentary parent material.

Elevations range from 6,500 to 7,200 feet. Precipitation ranges from 9 to 11 inches. Erosion is slight to moderate. Vegetation consists of big sagebrush, black sagebrush, yellowbrush, blue grama, Indian ricegrass, needleandthread, Lettermans needlegrass.

Available water-holding capacity ranges from 6 to 10 inches in a 5-foot profile for the Torrifuvents and from 3 to 5 inches for the gravelly and Calciorthid soils.

Range sites are semi-desert loam, semi-desert gravelly loam, and semi-desert stony loam.

Association 224

This association consists entirely of Torrifuvents. About 40% of the area has very cobbly or extremely stony (40 to 70% coarse fragments), moderately-coarse textured soils; 60% of the area has about 20 to 30 inches of moderately-coarse soils over a gravelly or cobbly sandy loam with 30 to 50% coarse fragments. These soils are derived from igneous parent material.

They are on alluvial fans with slopes of 2 to 6%. Along the drainage way there is an accumulation of cobbles and stones from flash floods; in the other areas there are some small sand dunes. The exposure is north with elevations from 6,000 to 6,500 feet. The precipitation ranges from 9 to 11 inches.

The vegetation consists of big sagebrush, yellowbrush, fourwing saltbush, blue grama, sand dropseed, Indian ricegrass, annual weeds, Russian thistle, cactus and buckwheat. Available water-holding capacity ranges from about 3 to 6 inches for a 5-foot profile depending on the amount of coarse fragments.

The range sites are semi-desert gravelly loam and semi-desert stony loam.

Association 226

This association consists of about 80% Argiborolls and 20% Calciborolls derived from basic igneous parent material. The Argiborolls are deep, well drained, with a medium textured surface (A)

and a clay loam B2t horizon extending to a depth between 20 and 42 inches. Some soils have strong lime horizons below the B2t; others are noncalcareous throughout. About 85% of the Argiborolls have 20 to 50% cobbles throughout the profile; the other 15% are free of coarse fragments. The Calciborolls are about medium textured throughout with a strong lime horizon between 15 and 24 inches. About half the Calciborolls have 30 to 50% cobbles throughout the profile; the other half are relatively free of coarse fragments. There are some occasional Rock outcrops.

These soils are on hills and mountain slopes on all exposures. The slopes range from 30 to 50%, more common from 15 to 30%. Erosion is slight. The elevation ranges from 7,000 to 8,000 feet. Precipitation is about 12 to 18 inches.

The vegetation consists of big sagebrush, oakbrush, Indian ricegrass, bluebunch wheatgrass, some forbs and some occasional pinyon. The available water-holding capacity is about 9 to 11 inches in a 5-foot profile for the soils free of coarse fragments and 5 to 7 inches for the soils with coarse fragments.

The range sites are upland loam, upland gravelly loam, and upland limy loam.

Association 227

This association consists of about 60% very stony or extremely stony Argic Cryoborolls, 20% deep Argic Cryoborolls relatively stone free, 10% Typic Cryoborolls, and 10% Lithic Cryoborolls and Rock outcrops. The stony soils have a medium textured surface with 15 to 50% stones and cobbles; the B2t horizons are a clay loam extending to a depth of about 24 to 36 inches with 30 to 60% stones and cobbles; the C horizons are medium or moderately-coarse textured with 40 to 70% stones and cobbles. The deep soils have a medium textured surface and a clay loam B2t horizon extending to a depth of 30 to 42 inches. In some locations the C material is cobbly or stony. The Typic Cryoborolls are medium textured and cobbly throughout with little or no soil development. There are about 30 to 50% cobbles or stones throughout the profile. The Lithic Cryoborolls have about 6 to 15 inches of cobbly or stony medium textured soil over igneous bedrock.

These soils are on high plateaus, mountain slopes and small valleys on all exposures. The slopes range from 3 to 30% with 5 to 15% being more common. They are slightly to moderately eroded. The precipitation is estimated at 18 to 23 inches. The elevation ranges from 8,500 to 9,200 feet.

The vegetation consists of two main groups: Sagebrush-grass and aspen-grass and include big sagebrush, Columbia needlegrass,

Kentucky bluegrass, dryland sedge, western wheatgrass, mountain muhly, Sandberg bluegrass, bitterbrush, and aspen. The available water-holding capacity of the stony soils ranges from 5 to 8 inches for a 5-foot profile; the deep soil, 9 to 11 inches; and the shallow soils from 1 to 2 inches.

The range sites are mountain loam, mountain gravelly loam, mountain stony loam, and mountain shallow loam.

Association 228

This association consists principally of Cryoborolls. They are forming from colluvium, alluvium, and residuum from limestone parent material. About 50% are Argic Cryoborolls that are moderately deep to deep with thin A1 horizons 2 to 6 inches thick, usually gravelly loam texture with gravelly loam or gravelly sandy clay loam B2t horizons that are about 10 inches thick. They have gravelly or very gravelly Cca horizons of loam or sandy loam texture underlain by weathering limestone parent material at about 24 to 48 inches. About 40% of the soils are Lithic Cryoborolls and Typic Cryoborolls that are shallow and moderately deep with thin gravelly A1 horizons and gravelly or very gravelly loam or sandy loam C or Cca horizons underlain by limestone parent material at 10 to 30 inches. About 10% are Argic Lithic Cryoborolls with clay B2t horizons that are underlain by limestone bedrock at about 10 to 20 inches. Other groups include Cryochrepts and Rendolls.

Slopes range from 5 to 50%. Erosion is usually moderate. Precipitation is estimated at 17 to 20 inches. The elevation ranges from 7,900 to 8,400 feet.

The vegetation consists of yellow pine, manzanita, bitterbrush, horsebrush, red cedar, Indian ricegrass, squirreltail and dryland sedge.

Range sites are upland gravelly loam, upland stony loam, and upland shallow loam.

Association 229

This association consists of the Bryce Canyon breaks. The soils are about 30% Lithic Haplustolls, 10% Ustorthents derived principally from limestone with some shale and sandstone, and 60% Rock outcrops. The Lithic Haplustolls consist of 2 to 6 inches of medium textured soil over weathering bedrock. The Ustorthents are gravelly medium textured, moderately-deep and deep over bedrock.

The topography consists of very rough, broken land, sheer cliffs and rolling hills. The elevation runs from 6,500 to 8,800 feet. Erosion is mainly geologic but is of considerable extent.

The vegetation is very sparse yellow pine, pinyon, juniper, manzanita, western wheatgrass, and Indian ricegrass.

This is dominantly class VIII land.

Association 230

This area consists of about 80% Ustorthents and 20% Lithic Haplustolls. The Ustorthents are medium textured and have 40 to 60% gravels or cobbles through most of the profile and are derived from sandstone and limestone parent material. The Lithic Haplustolls consist of about 5 to 20 inches of moderately-fine textured soil over shale.

These soils are on rolling hills and gently sloping ridge tops on slopes of 3 to 20% on all exposures. The elevation runs from 6,200 to 7,500 feet. The area is moderately eroded. Precipitation ranges from 11 to 13 inches.

The vegetation consists of pinyon, juniper, cliffrose, Brigham tea, western wheatgrass and Indian ricegrass.

Available water-holding capacity in the Ustorthents is about 5 to 7 inches for a 5-foot soil depth and 1 to 3 inches in the Lithic Haplustolls to the depth of the shale.

Range sites are upland loam, upland gravelly loam (juniper-pinyon), and upland shallow shale.

Association 231

This association consists of dominantly Calciborolls. There are minor amounts of Argiborolls. These soils consist of about 70% medium textured soils with limy gravelly (30 to 60% gravel) material that occur at about 5 to 20 inches. About 30% are medium textured soils with limy gravelly material between 20 and 36 inches. In some locations the surface soils are leached of lime. They are derived principally from limestone with some sandstone, quartzite and igneous rocks.

These soils are on gently rolling bench land on slopes of 2 to 10%. Elevations range from 7,400 to 7,600 feet. Erosion is slight. Precipitation ranges from 12 to 14 inches.

Vegetation consists of black sagebrush, Lettermans needlegrass, western wheatgrass, Indian ricegrass, Sandberg bluegrass, bull grass, snakeweed, and pussytoes. The available water-holding capacity ranges from 4 to 7 inches for a 5-foot profile depending on the amount and depth of the gravel.

Range sites are upland gravelly loam, upland loam, and upland limy loam.

Association 232

This mapping unit consists of deep, well drained, medium and moderately-fine textured Haplustolls and Torrifuvents. These soils are in a long alluvial valley on slopes of 2 to 4%. They are derived from sandstone and limestone parent material.

Elevation ranges from 7,000 to 7,600 feet. Gully erosion is common. Precipitation ranges from 11 to 13 inches.

The vegetation consists of rabbitbrush, big sagebrush, black sagebrush, Indian ricegrass and needleandthread grass. A small acreage has been seeded to crested wheatgrass. Some small areas are used for dry and irrigated cropland. These soils will hold from 10 to 12 inches of available water in a 5-foot profile.

Range sites are upland loam (70%), and semi-desert loam (30%). Capability classes and subclasses are IIIc (60%), IIIe (40%) if irrigated, and IVc and IVe if nonirrigated.

Association 233

This mapping unit consists almost entirely of gravelly or cobbly soils. About 65% are Calciorthiss, 30% Torrifuvents and 5% Haplargids developed from igneous parent material. The Calciorthiss are usually medium textured to a depth of 10 to 15 inches and then range from medium to moderately-coarse. About 30 to 50% gravels or cobbles occur in the surface and through the profile in some soils, while others have the surface 10 to 20 inches free of coarse fragments. Only about 10 to 15% of the area would fall in the latter type. Strong lime horizons occur between 10 and 20 inches, usually about 12 inches. The Torrifuvents are very much like the Calciorthiss except they do not have a strong lime horizon. The Haplargids are weakly developed with loam or sandy loam A horizons 5 to 8 inches thick, heavy loam Bt horizons 7 to 11 inches thick, and gravelly C horizons with a strong lime horizon.

The soils in this association are on alluvial fans, benches, and hills. The slopes are generally between 2 and 15% except the hills south of Antimony where the slopes range from 5 to 50%. The Haplargids are on gently sloping fans on slopes of 2 to 5%. Erosion is moderate, elevations range from 5,500 to 7,000 feet, and precipitation ranges from 8 to 12 inches.

Vegetation consists of shadscale, black sagebrush, yellowbrush, snakeweed, big sagebrush, Indian ricegrass, cheatgrass, Russian thistle, and squirreltail. The available water-holding capacity

is about 4 to 6 inches for a 5-foot profile depending on the amount of gravel or cobbles.

The range sites are semi-desert limy loam, and stony loam or gravelly loam.

Association 234

This association consists of about 95% shale hills and Lithic Torriorthents. There are a few small areas that have a capping of sandstone and other areas that have a gravelly or stony mantle of igneous material. About 5% are Torrifluvents that occur in small alluvial valleys. The Lithic Torriorthents consist of about 5 to 15 inches of moderately-fine or fine texture soil over weathering shale. The shale hills consist of weathering shale. The Torrifluvents are deep and medium textured.

The slopes range from 3 to 70%, dominantly from 20 to 40%. Elevation ranges from 5,100 to 6,000 feet; precipitation ranges from 8 to 11 inches.

The vegetation consists of shadscale, greasewood, juniper, some occasional Indian ricegrass, needleandthread, and galleta grass. These soils will hold from about 1 to 3 inches of available water except the Torrifluvents which will hold 10 inches to a depth of 5 feet.

Range sites are semi-desert shale hills and semi-desert shallow shale.

Association 235

This association consists of about 45% gravelly or cobbly Calciorthids, 15% gravelly Paleorthids, 35% gravelly Torrifluvents and 5% deep medium textured Torrifluvents derived from sedimentary parent material. The Calciorthids consist of soils ranging from 20 to 50% gravel and cobbles throughout the profile to soil with the surface free of coarse fragments and gravelly material found between 10 and 20 inches. The textures are sandy loam or loam. In some locations, straight sand and gravel occur below about 24 to 30 inches. Strong lime horizons occur usually between 10 and 20 inches. The Paleorthids are similar except the strong lime horizon has been cemented into a lime hardpan. Roots and water in most cases can only penetrate this hardpan material in the cracks. The gravelly Torrifluvents are very similar to the Calciorthids except they do not have strong lime horizons and straight sand and gravel may be found at a shallower depth.

These soils occur along the west side of Sevier Valley from Richfield on the south to west of Gunnison on the north and south of Scipio. They are on alluvial fans along many little canyons in this area and south of Scipio. The main exposure is east facing, on slopes of about 2 to 10%. There are short north and south facing slopes into the drainage ways that occasionally run up to 25%. The area is generally moderately eroded. The elevation ranges from 5,000 to 6,000 feet, precipitation from 8 to 10 inches.

The vegetation consists of shadscale, black sagebrush, big sagebrush, bud sage, horsebrush, galleta, Indian ricegrass, cheatgrass, Russian thistle and juniper. Available water-holding capacity ranges from about 3.5 to 7.0 inches in a 5-foot soil profile depending on the amount of gravel.

Range sites are semi-desert loam, semi-desert hardpan, semi-desert stony loam, and semi-desert gravelly loam.

Association 236

This association consists of about 40% Argiustolls, 30% Lithic Haplustolls, 18% Rock outcrops, 10% intermixed Ustorthents and Calciustolls and 2% Torrifluvents derived principally from igneous parent material and some shale outcrops.

About one-half of the Argiustolls are stony, the other half extremely stony. The stones are found throughout the profile. The surface soils are a loam texture 5 to 10 inches thick with heavy loam to light clay B2t horizons about 8 to 20 inches thick and a strong lime horizon occurring at about 12 to 24 inches. The C horizons are medium or moderately-coarse textured. These soils are on hills, rough broken mountain slopes, on slopes of 10 to 50%. The Lithic Haplustolls have from 5 to 10 inches of soil over bedrock and occur on rough broken mountain slopes and canyons with slopes of 10 to 70%, dominantly on 30 to 60% slopes. The Ustorthents and Calciustolls are usually cobbly with 30 to 50% cobbles and medium textured soil material. The Calciustolls have strong lime horizons between 10 and 20 inches. The Torrifluvents are deep, ranging from moderately-coarse to moderately-fine textured soils on slopes of 1 to 5%.

The elevation ranges from 6,000 to 8,000 feet and the precipitation from 10 to 16 inches. Erosion is moderate with considerable geologic erosion and high runoff from the shallow soils and rock outcrops.

The vegetation consists of pinyon, juniper, big sagebrush, Indian ricegrass, bluebunch wheatgrass, squirreltail, cheatgrass, and a number of forbs. There is also mountainmahogany in some

locations. The water-holding capacity ranges from about 4 to 8 inches for a 5-foot profile, except the Lithic Haplustolls which hold 0.75 to 1.5 inches.

The range sites are upland stony loam, upland gravelly loam, and upland shallow loam, with much of the land being wasteland.

Association 237

This association consists of about 65% Calciorthids, 20% Lithic Torriorthents, 10% Torrifluvents, and 5% Rock outcrops derived from igneous parent material.

The Calciorthids are medium textured and very cobbly with some stone. They have 50 to 80% cobbles throughout the profile and usually the amount increases with depth. Strong lime horizons occur at about 8 to 15 inch depths. These soils are on hills, benches, and fans on slopes of 10 to 60%, dominantly 20 to 30% slopes. The Lithic Torriorthents have about 5 to 10 inches of extremely stony medium textured soils over basalt on steep to very steep lower mountain slopes and foothills on slopes of 20 to 70%. The Torrifluvents are medium textured and have 20 to 40% cobbles throughout the profile. They are on fans with slopes of 5 to 20%.

Erosion is slight to moderate, elevation ranges from about 5,800 to 7,000 feet, and precipitation ranges from 9 to 12 inches.

The vegetation consists of shadscale, black sagebrush, yellow-brush, Indian ricegrass, squirreltail, blue grama, buckwheat, Russian thistle and cheatgrass. The available water-holding capacity of the Calciorthids ranges from about 4 to 6 inches for a 5-foot profile, the Lithic Torriorthents from 0.75 to 1.5 inches and the Torrifluvents from 5 to 7 inches.

The range sites are semi-desert shallow loam, semi-desert stony loam, and semi-desert gravelly loam.

Association 238

This association consists of about 85% gravelly Torrifluvents and 15% deep Torrifluvents. These soils are well and somewhat excessively drained and are on alluvial fans and flood plains on slopes of 1 to 10%, more common from 2 to 4%. The gravelly soils are moderately-coarse or medium textured with gravelly material ranging from gravelly loam to sand and gravel which occurs at about a 5 to 20 inch depth. The deep soils are moderately-coarse or medium textured.

Elevation ranges from 5,100 to 6,000 feet. Precipitation ranges from 8 to 10 inches. Erosion is slight to moderate. This irrigated

cropland is used for alfalfa and small grain and occasionally for sugar beets and corn. In years when irrigation water is limited, much of this land is idle. Available water-holding capacity ranges from 3 to 5 inches in the gravelly soils and 6 to 10 inches in the deep soils for a 5-foot profile.

The dominant capability classes and subclasses are IIIs, IVs, IIe, IIIe, IVe, and IIs.

Association 239

This association consists of about 60% deep, well drained Torrifluvents and 40% well to somewhat excessively drained gravelly Torrifluvents. The deep soils range from moderately-coarse to fine textured but they are dominantly medium textured. The gravelly soils consist of moderately-coarse and medium textured soils underlain by gravelly material ranging from gravelly loam to sand and gravel found at depths from 5 to 20 inches.

These soils are on alluvial fans and flood plains on slopes of 1 to 6%, dominantly 2 to 3%. Erosion is only slight in most areas, and moderate in other. Elevation ranges from 6,000 to 7,000 feet. Precipitation ranges from 8 to 12 inches.

These are irrigated croplands and are used principally for alfalfa and small grain with minor amounts of irrigated pasture and potatoes. Available water-holding capacity ranges from 6 to 11 inches in the deep soils and 3 to 5 inches in the gravelly soils in a 5-foot profile.

Land capability classes and subclasses are IIIC, IIIe, IIIs, and IVs.

Association 240

This association consists of about 50% gravelly, well to somewhat excessively drained Torrifluvents; 30% deep, well drained Torrifluvents; and 20% well to somewhat excessively drained gravelly Calciorthids. The gravelly soils range from moderately-coarse to moderately-fine textured and are underlain by gravelly material ranging from gravelly loam to sand and gravel occurring at depths of 5 to 20 inches. The deep soils range from medium to moderately-coarse. The Calciorthids are similar to the gravelly soils except they have a strong lime horizon. There are a few small areas of Argiustolls.

These soils are on alluvial fans and flood plains on slopes of 1 to 10%, dominantly 2 to 4%. Erosion is slight in most areas and moderate in others. Elevation ranges from 6,000 to 7,000 feet.

Precipitation ranges from 8 to 12 inches. These are irrigated croplands and are used principally for alfalfa, small grains and potatoes with minor amounts of irrigated pasture. Available water-holding capacity ranges from 3 to 5 inches in the gravelly soils and from 6 to 10 inches in the deep soils for a depth of 5 feet.

Land capability classes and subclasses are IIIC, IIIS, IIIe, IVS and IVe.

Association 241

This association consists of about 50% stony miscellaneous land forms, 40% stony Argixerolls and 10% deep Haploxerolls. The miscellaneous land forms consist of soils with about 60 to 70% mixed stony and bouldery subsoils. Some of the areas have B2t horizons, others have no development. These soils are on steep to very steep mountain slopes of 20 to 50%. The Argixerolls have very stony or extremely stony (10 to 50% stones) medium textured surface soils 5 to 12 inches thick, very stony (10 to 25% stones) heavy medium or moderately-fine textured B2t horizons 10 to 24 inches thick, and very stony or extremely stony C horizons. Some locations have strong lime horizons. These soils are on strongly sloping to very steep mountain slopes with slopes of 10 to 40%. The small alluvial valleys have deep Haploxerolls, usually medium textured and free of coarse fragments. However, some areas may have up to 10 to 15% cobbles. These soils are on slopes of 1 to 5%. The general slope is to the west but there are north and south facing slopes.

Erosion is slight to moderate, elevation ranges from 7,000 to 8,000 feet, and precipitation ranges from 13 to 20 inches.

The vegetation consists of juniper, pinyon, mountainmahogany, oakbrush, big sagebrush, bitterbrush, spiked wheatgrass, Indian ricegrass, along with other browse and forbs. Available water-holding capacity in the miscellaneous land forms is about 2 to 5 inches in a 5-foot profile depending on the amount of stones. The Argixerolls will hold about 5 to 8 inches and the Haploxerolls up to 10 inches in a 5-foot profile.

The range sites are upland shallow loam, upland stony loam, and upland loam.

Association 242

This association consists of about 70% Argixerolls and 30% Calcixerolls. The Argixerolls have medium or moderately-fine textured A horizons 7 to 12 inches thick; moderately-fine or fine textured B2t horizons 12 to 24 inches thick with some soils having strong lime horizons while others are noncalcareous throughout;

and C horizons which range from gravelly loams to clay loams. These soils are in open valleys on slopes of 1 to 5%. The Calcixerolls are on rolling hills and ridge tops on slopes of 3 to 15%. These soils are usually cobbly on the surface with medium textured soils and cobbles or gravel throughout the profile ranging from about 15 to 40%; usually the amount of coarse fragments increases with depth. Strong lime horizons occur at 10 to 20 inches.

Erosion is slight, elevation ranges from 6,500 to 7,500 feet, and precipitation from 11 to 16 inches.

The vegetation consists of mainly big sagebrush, with western wheatgrass, tall native poa, Lettermans needlegrass, Indian ricegrass, spiked wheatgrass, yellowbrush and forbs. The available water-holding capacity for the Argixerolls is 9 to 11 inches for a 5-foot profile and 5 to 7 inches for the Calcixerolls.

Range sites are upland loam, and upland gravelly loam.

Association 243

This mapping unit consists of about 75% Argixerolls, 20% Haploxerolls and 5% Rock outcrops. The Argixeroll soils have a medium textured cobbly (25 to 50% cobbles) surface 8 to 12 inches thick, very cobbly or cobbly (30 to 60% cobbles) moderately-fine textured B2t horizons about 12 to 20 inches thick and very cobbly or cobbly medium textured C horizons. In most locations, there is a strong lime horizon between 20 and 36 inches. The Haploxerolls are generally medium textured and have 30 to 60% stones and cobbles on the surface and throughout the profile. However, there are a few very small, narrow valleys with deep soils free of coarse fragments. They are all derived from igneous parent material.

These soils are on rolling and steep mountain slopes on slopes of 10 to 30% and on all exposures. Erosion is slight to moderate, elevation ranges from 7,600 to 8,000 feet, and precipitation ranges from 15 to 18 inches.

The vegetation consists of big sagebrush, bitterbrush, mountain-mahogany, sparse stands of oakbrush, spiked wheatgrass, Lettermans needlegrass, threeawn grass, Columbia needlegrass, along with a few forbs. The available water-holding capacity ranges from about 4 to 8 inches depending on the amount of stones or cobbles.

The range sites are upland stony loam and upland gravelly loam.

Association 244

This association consists of Torripsamments and Natrargids derived mostly from sandstone and mixed alluvium from the Sevier River. The Torripsamments comprise 75% of the area and the Natrargids comprise 25%.

The Torripsamments are deep, coarse textured, somewhat excessively drained, forming as sand dunes. The Natrargids have a sandy loam surface and moderately-fine textured subsoil and substratum that are alkali affected. These soils occur on lake terraces adjacent to the river.

Slopes range between 2 and 10%. Elevation ranges from 4,700 to 4,900 feet and the exposure is southwest to west. Precipitation ranges from 8 to 10 inches. Erosion is slight to severe wind erosion.

The vegetation is sagebrush, rabbitbrush, Russian thistle, greasewood, and shadscale. The available water-holding capacity in the Torripsamments is about 4 to 5 inches. The Natrargids hold about 9 to 11 inches of water in a 5-foot profile.

The range sites are desert sand and desert alkali flats.

Association 245

This association consists of Torripsamments and Torriorthents derived from sandstone, basalt and a variety of mixed rocks. Fifty percent of the area is Torripsamments. These soils are deep, loamy sand occurring as sand dunes. The other 50% are Torriorthents. These soils are sands and loamy sand which are usually underlain by gravel or gravelly coarse sand. They are all somewhat excessively drained.

Elevation ranges from 4,600 to 4,900 feet. Exposures are west, northwest and southwest. Slope ranges between 2 to 20% slopes. Erosion is moderate to severe, the latter occurring on the sand dunes. Precipitation ranges from 8 to 10 inches annually.

Vegetation is sagebrush, black sagebrush, Russian thistle, and horsebrush. Available water-holding capacity is 3 to 5 inches to a depth of 5 feet. Intake rate is very rapid due to the coarse textured soils.

Range site is desert sand.

Association 246

This association consists of Torripsamments, Aquic Calciorthids, Torrifluvents and Calciorthids. Parent material is quartzite, sandstone and weathered material from mixed rocks.

The Torripsamments comprise 45% of the area. These soils are deep, well drained sands forming as sand dunes with moderate to severe wind erosion. The Aquic Calciorthids comprise 35% of the area and are deep, medium and moderately-fine textured, imperfectly drained, underlain by a strata of gypsum and are moderately to strongly saline. Strong lime horizons occur in the subsoil. The Torrifluvents comprise 10% of the area. The soils are deep, medium and moderately-coarse textured and well drained. The Calciorthids comprise 10% of the area and are deep, medium textured and well drained with lime horizons in the subsoil.

Elevation ranges from 4,500 to 4,700 feet. Slopes range from 1 to 6% slopes on southwest and west exposures. Erosion is slight to moderate except on the sand dunes. The precipitation ranges from 7 to 8 inches.

Vegetation is shadscale, Russian thistle, and greasewood. The Torripsamments will hold about 4 to 5 inches of available water. All other soils will hold 7 to 10 inches to a depth of 5 feet.

The range sites are desert sand, desert alkali flats, and desert loam.

Association 247

This association consists of about 50% Torripsamments, 30% Rock land, and 20% Calciorthids. They are forming in basalt, sandstone, limestone, and quartzite.

The Torripsamments are deep, coarse textured, somewhat excessively drained soils occurring as small sand dunes. The Rock land has some medium to moderately-coarse textured, very shallow soil over basalt bedrock and Rock outcrops. The Calciorthids are deep, medium textured, well drained soils that have a lime horizon occurring within the subsoil.

The elevation ranges from 4,700 to 4,900 feet with west and south exposures. Slopes are 1 to 10%. Erosion is moderate to severe wind accumulations. Precipitation ranges from 7 to 8 inches.

Vegetation is shadscale, cheatgrass, sagebrush, yellowbrush, Russian thistle and small amounts of scattered juniper along outcrops of basalt. Available water-holding capacity in the Torripsamments is about 3 to 5 inches. The Calciorthids will hold about 8 to 10 inches of water to a depth of 5 feet.

The range sites are desert sand and desert loam. The Rock land is class VIII.

Association 248

This association consists of about 60% Rock outcrops and 40% Lithic Torriorthents derived from basalt. The Lithic Torriorthents are very shallow, medium textured soils over basalt bedrock.

Elevation ranges from 4,900 to 5,800 feet with southwest exposure with 6 to 8 inches of rainfall. Slopes are 5 to 40%.

Vegetation consists of yellowbrush, shadscale and cheatgrass. Available water-holding capacity is very low due to Rock outcrops and very shallow soils which range from 0.5 to 2.0 inches above the bedrock.

Rock outcrop would be Class VIII land and the Lithic Torriorthents, Class VIII or a desert shallow loam, depending on depth to bedrock.

Association 249

This association consists of Calcixerolls, Argixerolls and Haploxerolls. They are forming in limestone, sandstone and some quartzite parent material. The Calcixerolls comprise about 70% of the area, 20% are Haploxerolls and 10% Argixerolls.

The Calcixerolls are shallow to moderately-deep, medium textured well drained, with lime cemented hardpans and gravel. The Argixerolls are deep, medium textured with medium to moderately-fine textured B2t horizons and are generally underlain by a gravelly or cobbly substratum. The Haploxerolls are deep, medium to moderately-coarse textured, and well drained.

The elevation ranges from 5,000 to 6,000 feet with a west exposure. Erosion is slight. Slopes range from 1 to 10%. Annual precipitation is 12 to 14 inches.

These soils are used for dry cropland and rangeland. Available water-holding capacity in the Calcixerolls is about 6 to 8 inches and 8 to 10 inches in the Argixerolls and Haploxerolls.

Nonirrigated classes and subclasses are IIIc, IIIe, IVe, and IVs. Range sites are upland loam, and upland hardpan.

Association 250

This association consists of Calcixerolls and Haploxerolls. They are forming in sandstone and limestone parent material. The Calcixerolls comprise about 50% of the area; the other 50% are Haploxerolls.

The Calcixerolls are deep to moderately-deep, medium textured, well drained soils with some gravel occurring in the substratum. Strong lime horizons occur in the subsoil. The Haploxerolls are deep, medium textured, well drained highly productive soils.

The elevation ranges from 5,500 to 6,500 feet with east and northeast exposures. Erosion is slight to moderate. Slopes range from 1 to 6%. Precipitation ranges from 12 to 14 inches.

These soils are used for dry cropland. Available water-holding capacity is 6 to 10 inches to a depth of 5 feet.

The nonirrigated class and subclasses are IIIc, IIIe, and IIIs.

Association 251

This association consists of Haplaquepts, Aquic Xerofluvents and Torrifluvents. They are moderately to strongly saline. About 40% of the area is Haplaquepts which are poorly drained and are dominantly fine and moderately-fine textured. About 30% of the area is Aquic Xerofluvents which are somewhat poorly drained and are dominantly moderately-fine textured with some areas of fine medium textures. About 30% of the area is Torrifluvents that are well or moderately well drained. Textures range from moderately-fine to moderately-coarse. The Sevier River and its tributaries have contributed alluvial material to this area. Parent materials are sandstone, limestone, volcanic rocks, probably volcanic ash and shale. The river also traverses beds of gypsum, rock salt and rocks with high percent of sodium and magnesium salts. Therefore, the deposits consist of extremely wide ranges of geologic and mineralogic material.

The elevation ranges from 4,500 to 4,700 feet. Erosion is slight. Slopes range from 0 to 2%. Average annual precipitation is 7 to 9 inches.

The available water-holding capacity ranges from 8 to 11 inches. These soils are used principally for irrigated cropland.

Capability classes and subclasses are IIw, IIIw, IIs, IIIs, and IVs.

Association 252

This association consists of mainly miscellaneous land forms. Included are stony land, Rock land and Rock outcrops. The soils material consists of 50% stones, bedrock and outcrops. They are located under the rim of Parker Mountain on very steep mountain slopes and in many cases cliffs and ledges, many feet high. The area is in a climatic zone of about 14 to 18 inches precipitation, runoff is high and water-holding capacity very low.

The area is small and unimportant and is Class VIII.

Association 253

This association consists of Haplaquepts and Aquic Xerofluvents that are strongly saline and poorly and somewhat poorly drained. The parent material is from mixed alluvium occurring on alluvial flood plains. About 30% of the area consists of deep, silty clay and clay soils. Forty percent of the area consists of heavy silt loam, clay loams and silty clay loam. Thirty percent of the area consists of deep, moderately well to somewhat poorly drained, loam and fine sandy loams.

These soils occur at elevations of 4,500 to 4,700 feet. Precipitation ranges from 6 to 8 inches. Slopes range from 1 to 2% on south and southwest exposures. Erosion is slight.

Vegetation is greasewood, saltgrass and some shadscale. These soils will hold about 6 to 11 inches of available water in a 5-foot profile.

The range sites are desert alkali bottoms.

Association 254

This association consists of Haplaquepts and Aquic Calciorthids. Parent material is from mixed alluvium from igneous and sedimentary rocks. The Haplaquepts comprise 60% of the area, 25% are Aquic Calciorthids and 15% are Playas that have no vegetation and are covered by water during the wet season of the year.

The Haplaquepts are deep, poorly drained, strongly saline, heavy silt loams, clay loams and silty clay loams. A water table is at 45 inches. The Aquic Calciorthids are deep, somewhat poorly drained silt loams and silty clay loams. They are very strongly saline with lime accumulation occurring in the subsoil. A water table occurs at about 45 inches.

Elevation ranges from 4,450 to 4,600 feet. Slopes range from 1 to 3% on a southwest exposure. Precipitation ranges from 6 to 8 inches.

Vegetation is greasewood, saltgrass, alkali sacaton and pickleweed. The available water-holding capacity is 8 to 11 inches in a 5-foot profile.

The range sites are desert alkali flats and desert alkali bottoms.

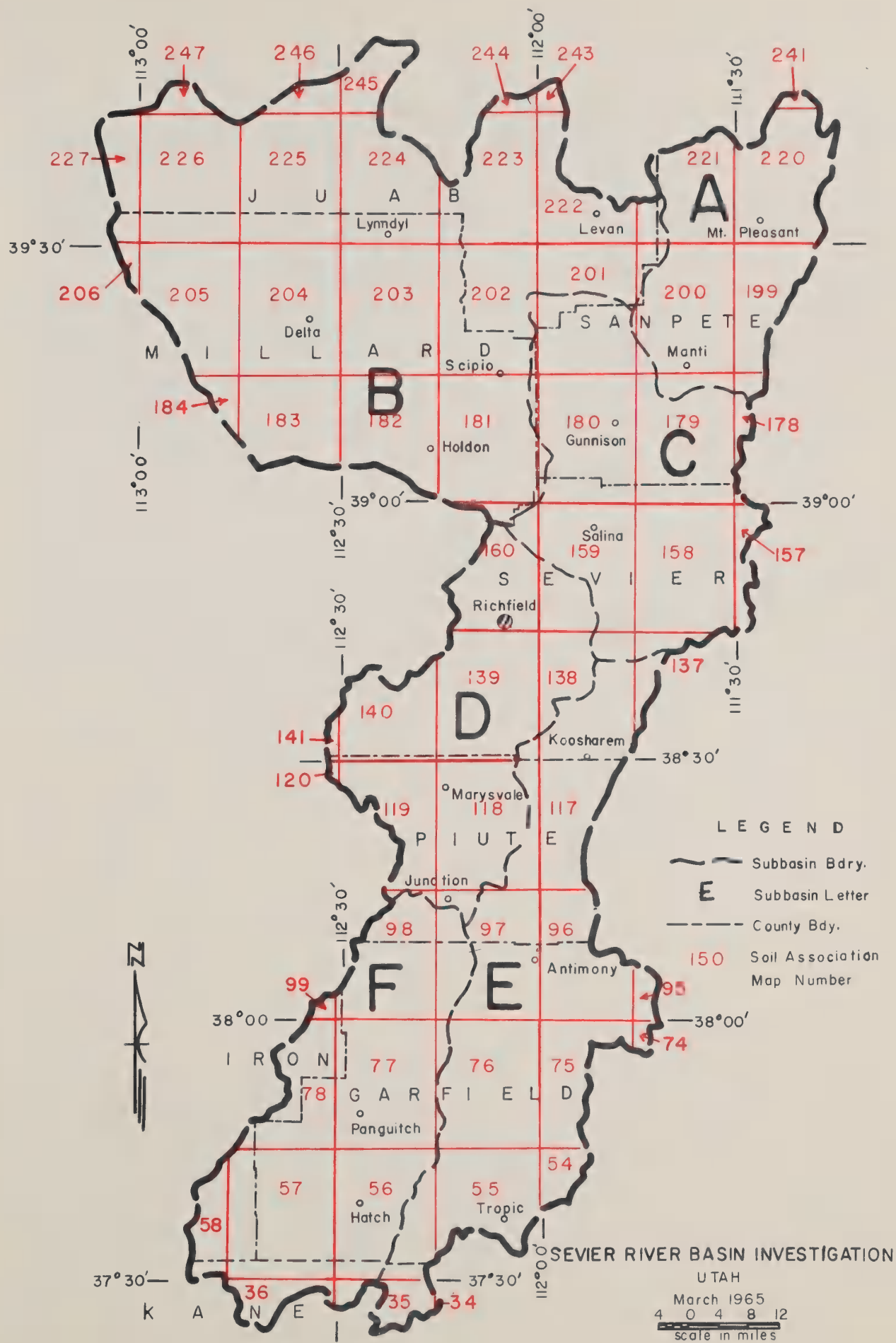
Association 255

This association consists of Torrifluvents from sedimentary and igneous rocks. About 50% of the area consists of deep, well drained, fine sandy loam soils which will hold about 6 inches of available water in a 5-foot profile. Fifty percent of the area consists of deep, silt loam, loams, and silty clay loam, well drained which will hold about 9 to 11 inches of available water in a 5-foot profile.

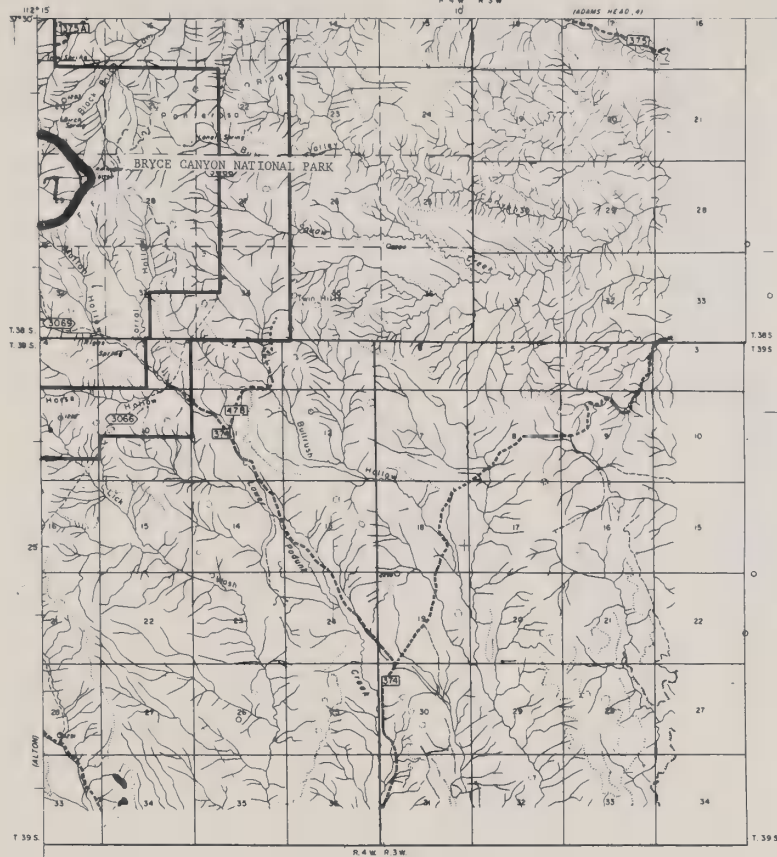
This unit occurs on alluvial fans and terraces on elevations ranging from 4,600 to 4,800 feet on slopes of 2 to 25% on west and south exposures. Precipitation ranges from 6 to 8 inches.

The vegetation is Russian thistle, shadscale, cheatgrass, and greasewood. Erosion is moderate to severe wind erosion.

The range site is desert loam.



M 47-IX-A



RAINBOW POINT, UTAH
BASIC M.F.

Note: Map numbers are underlined.

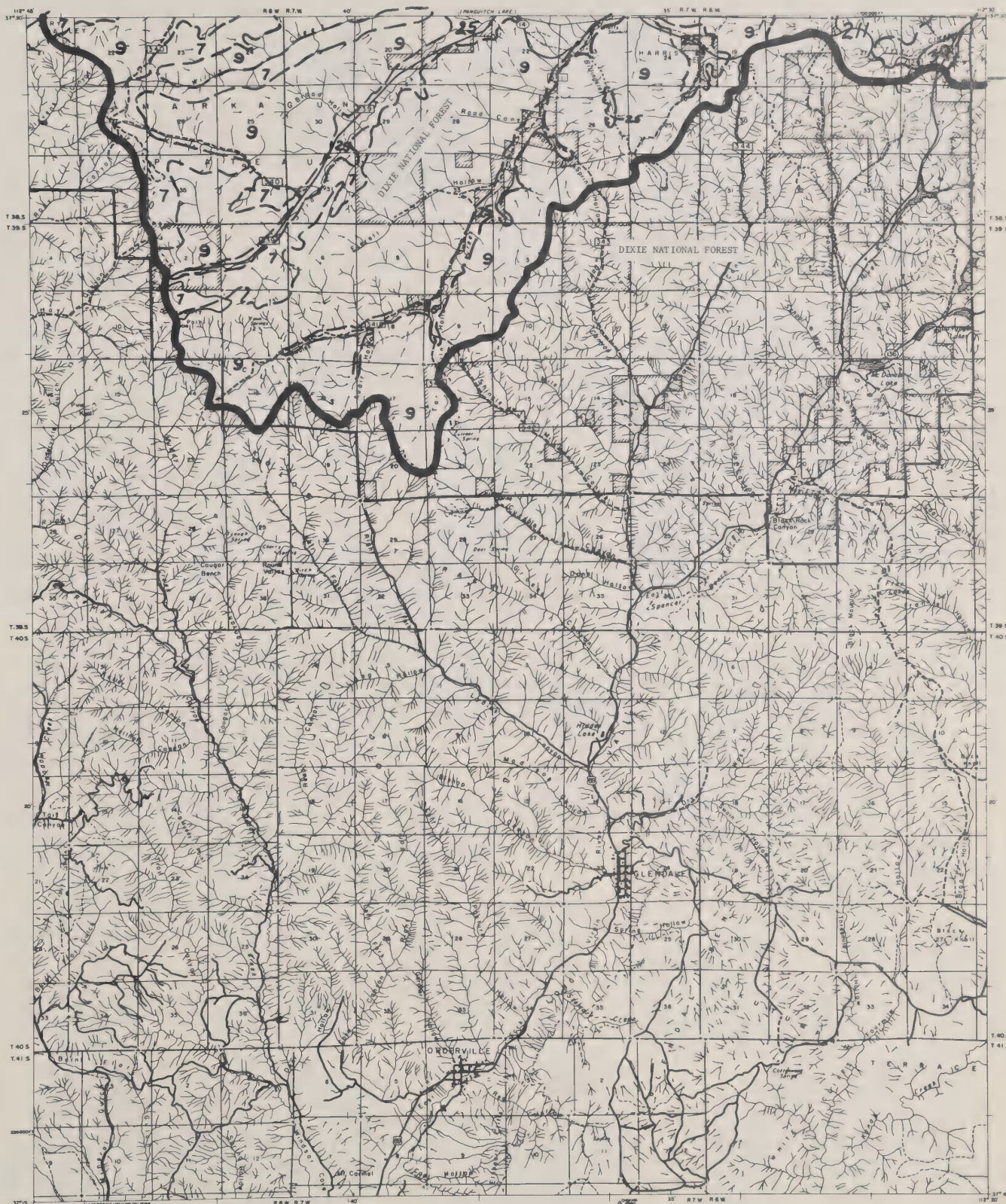
34 U



U.S. GEOLOGICAL SURVEY
 Prepared by the Utah State Office
 from a map of the Dixie National Forest
 by the U.S. Geological Survey
 in 1954

ALTON, UTAH
 DIXIE NF
 N 37° 15' W 112° 15' 15"

35 U



Compiled in 1958 by USFS, Reno, NV, from
USGS topographic maps, Aerial photographs 1955
Photocopy projection 1927 North American datum
10,000 feet grid based on Utah-Idaho Transfer
coordinate system

1:51,680
0 1 MILE

This map compares with U.S. national reconstruction for photographic control system

ORDERVILLE, UTAH
DIXIE NF
M-47-III-A

36 U

M 46-II-C



USGS Topographic Series Map
Constructed by Photogrammetry
Scale 60,000 (Horizontal Scale) 1953
Vertical Scale 1971 M.S.D.
Edited and Revised 1981

KAIPAROWITZ PEAK 3, UTAH
DIXIE N.F.
N 37° 30' - W 117° 45' 18"

54 U

17A 1446





N 37° 30' - W 112° E



Compiled in 1958 by USFWS, Reno, NV, from
USGS topographic maps, and other information.
Photocopy prepared by USFWS, Reno, NV, from original.
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1:50,000
Scale
This map is published with USFWS approval for publication under the
National Forest System.

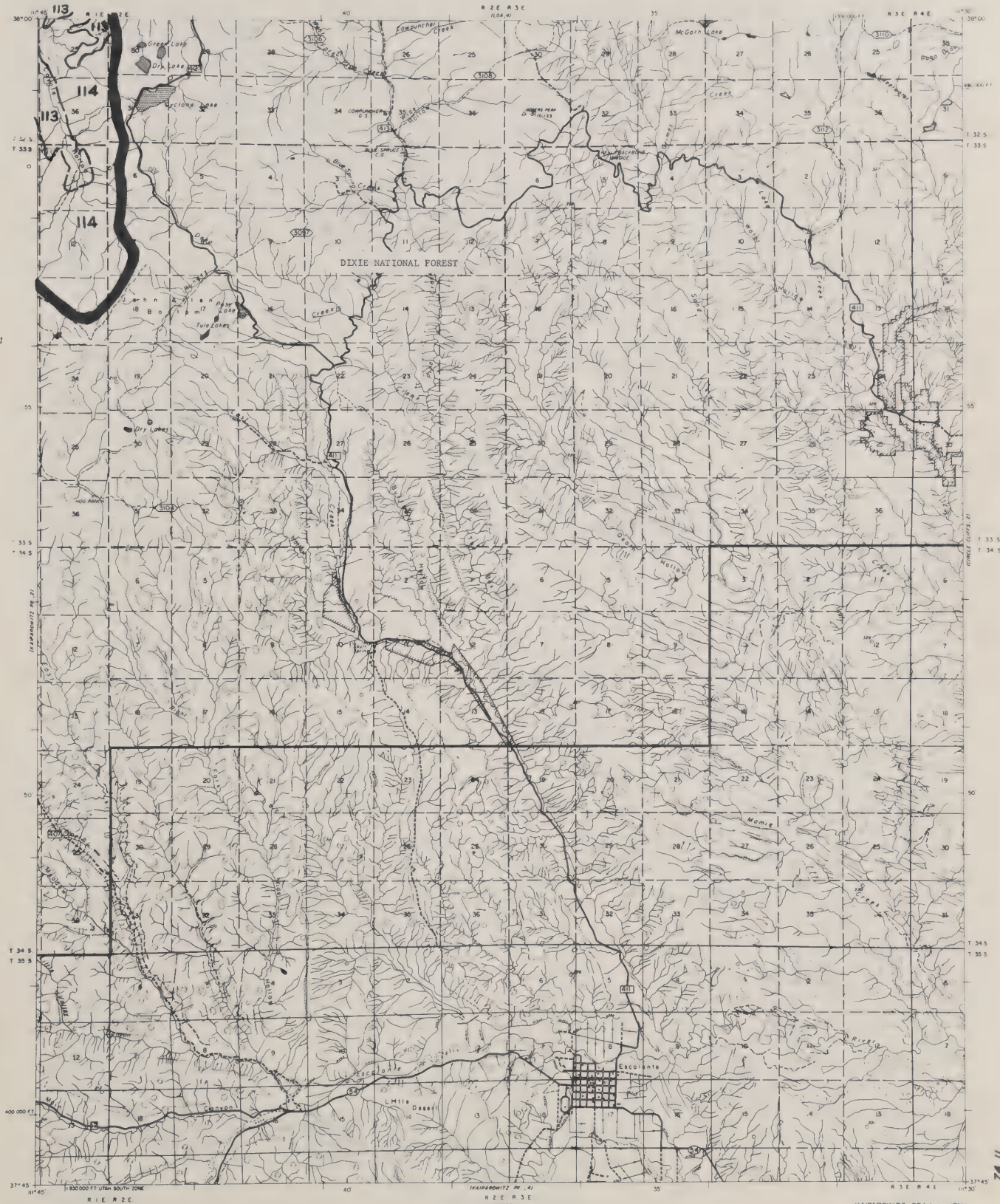
PAROWAN, UTAH
DIXIE NF
M-47-33-0 54727

17A

18A

19A

M46-II-A



U.S.F.S. Photographic Series Map
Compiled by Photographic Series Map
From 1:62,500 Photographs, Series 1534
Photometric Projection-1927 NAD
Edition and Revision 1961

1:31,680

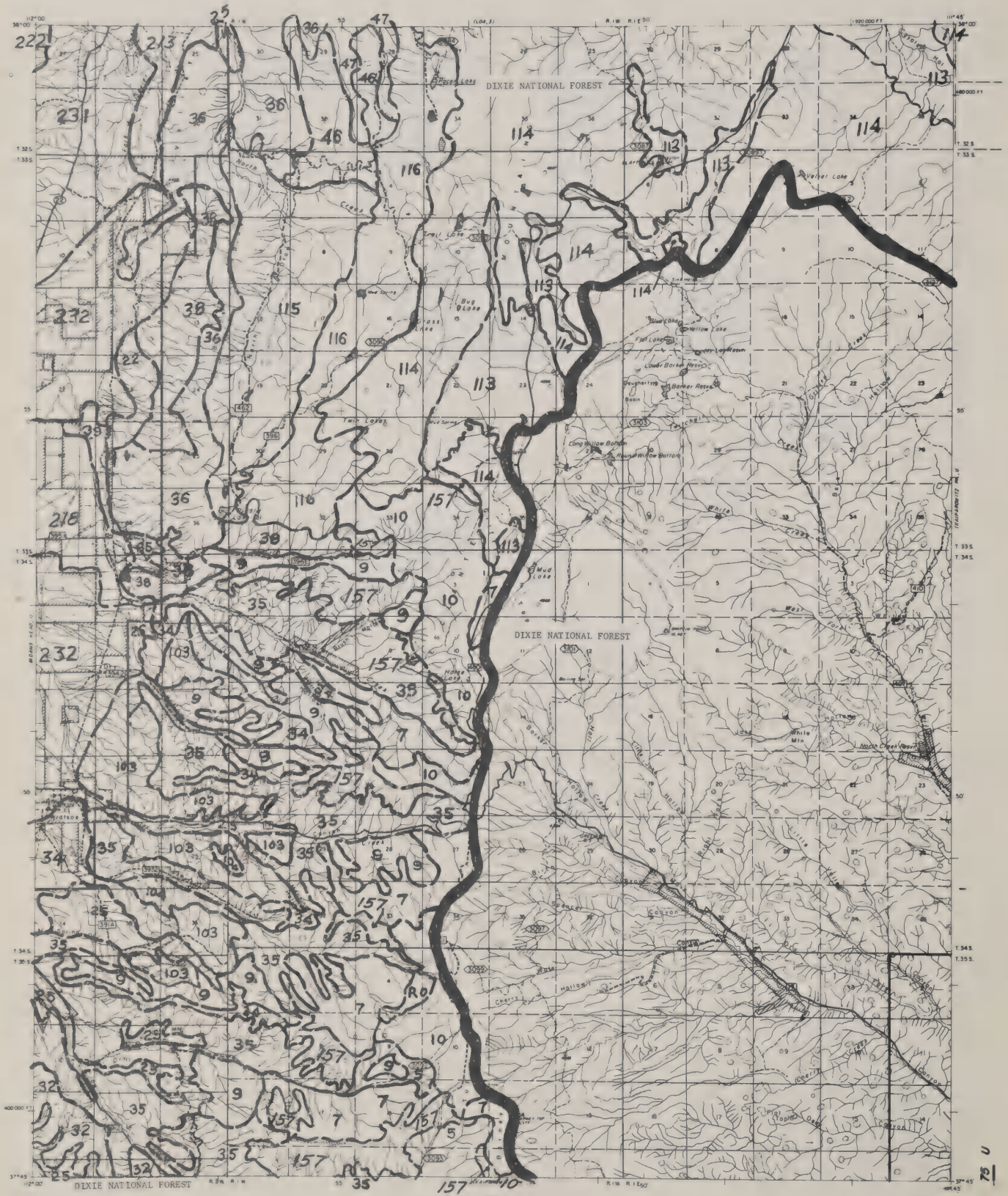
18A

KAIPAROWITS PEAK I, UTAH
DIXIE N.F.
N 37° 45' W 117° 30' 15"

19A

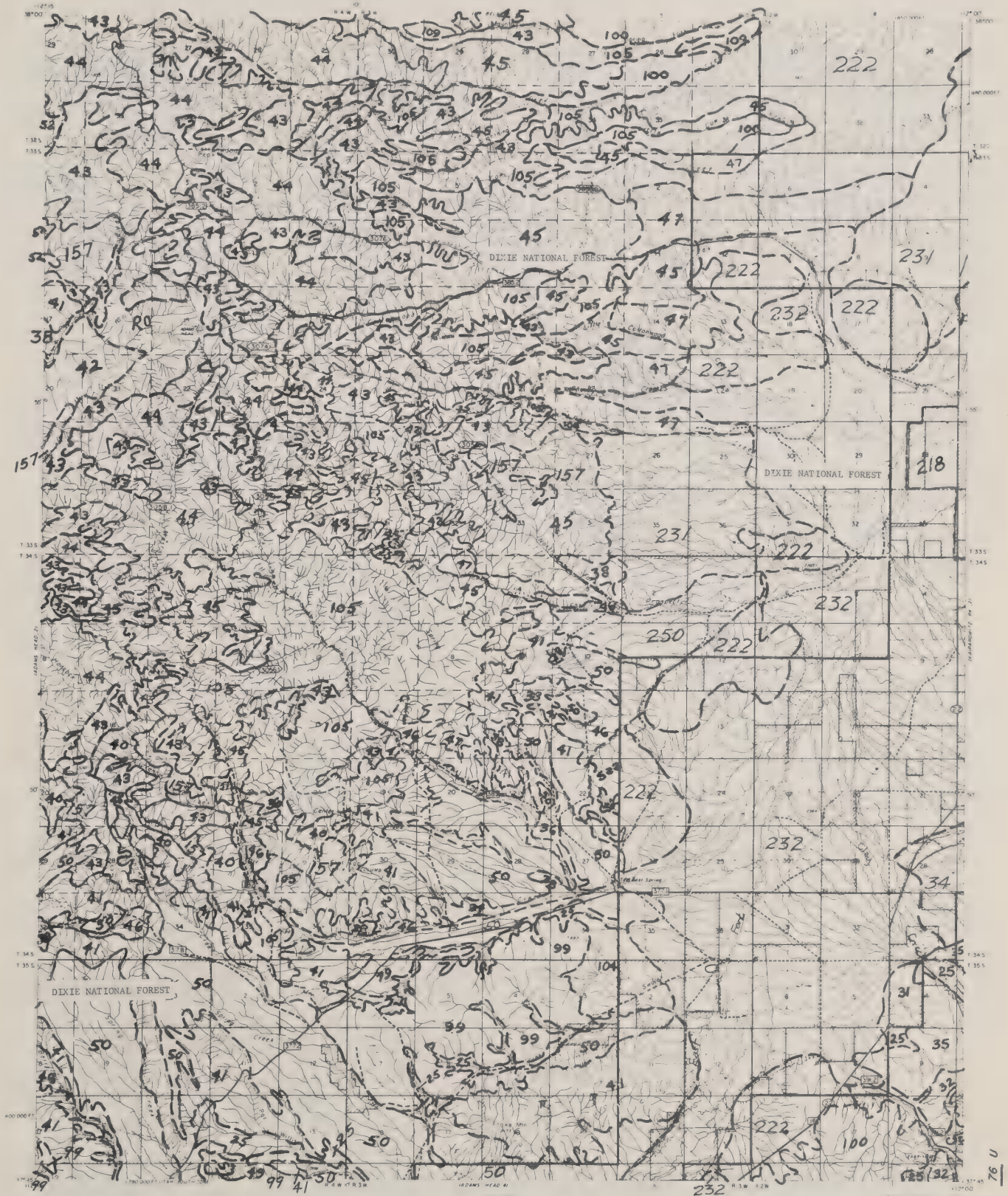
74 U

M46-II



U.S. S. Photographic Series Map
 Contained by Photographic Series
 Plan - 60000 Photographic Series
 Photographic Series - 1977 N.S.
 Contained by Series Map

KARPOWITZ PEAK 2, UTAH
 DIXIE N. F.
 N 37°45' - W 104°45' 00"



USGS National Geographic Society
 1:50,000 Scale
 1964 Edition
 1:50,000 Scale
 1964 Edition

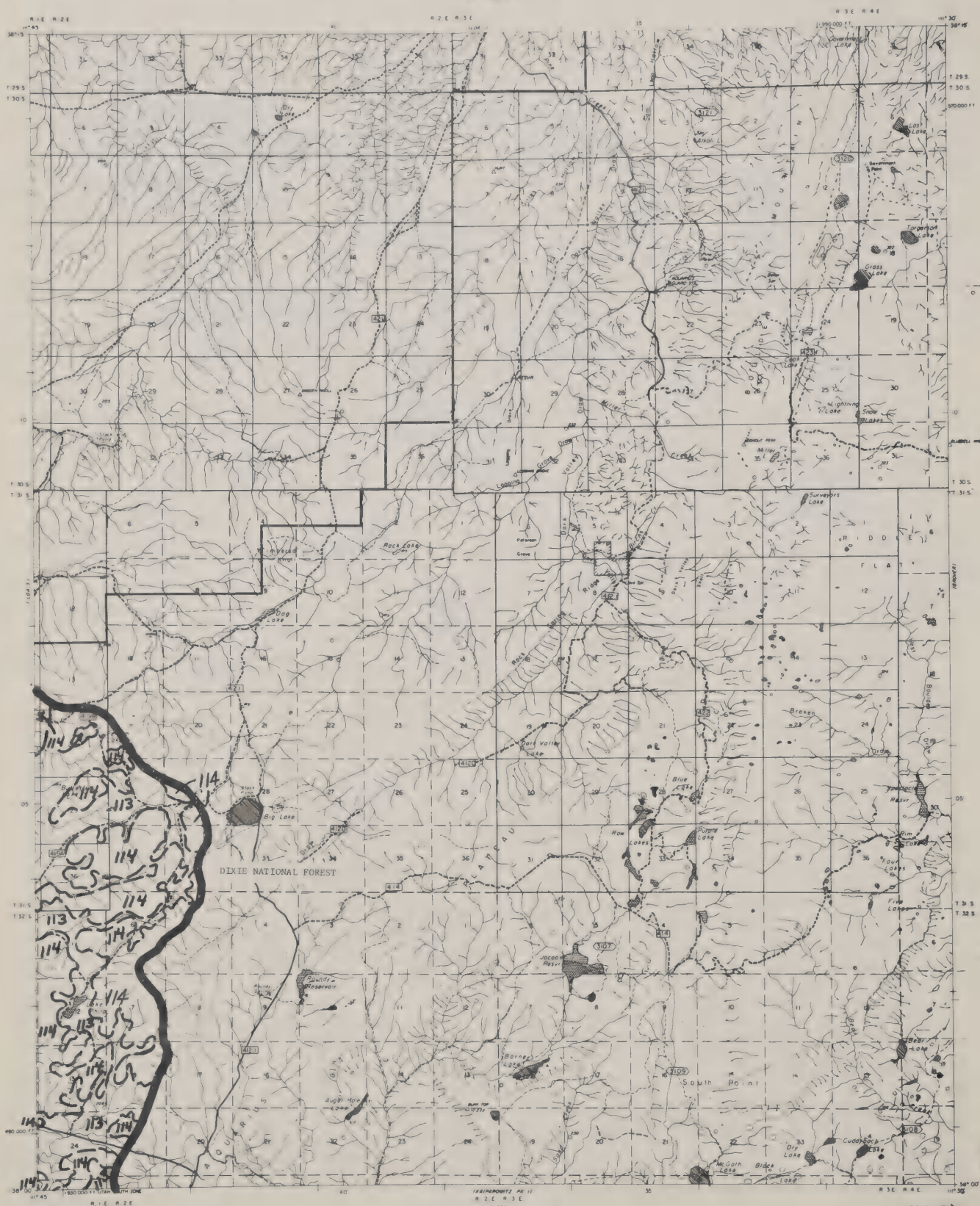
1:50,000

ADAMS HEAD, UTAH
 DIXIE N.F.
 N37°45'W-112°00'W M47-1-A

76 U



PAROWAN I, UTAH
UTAH PROJECT
M-47-II-A

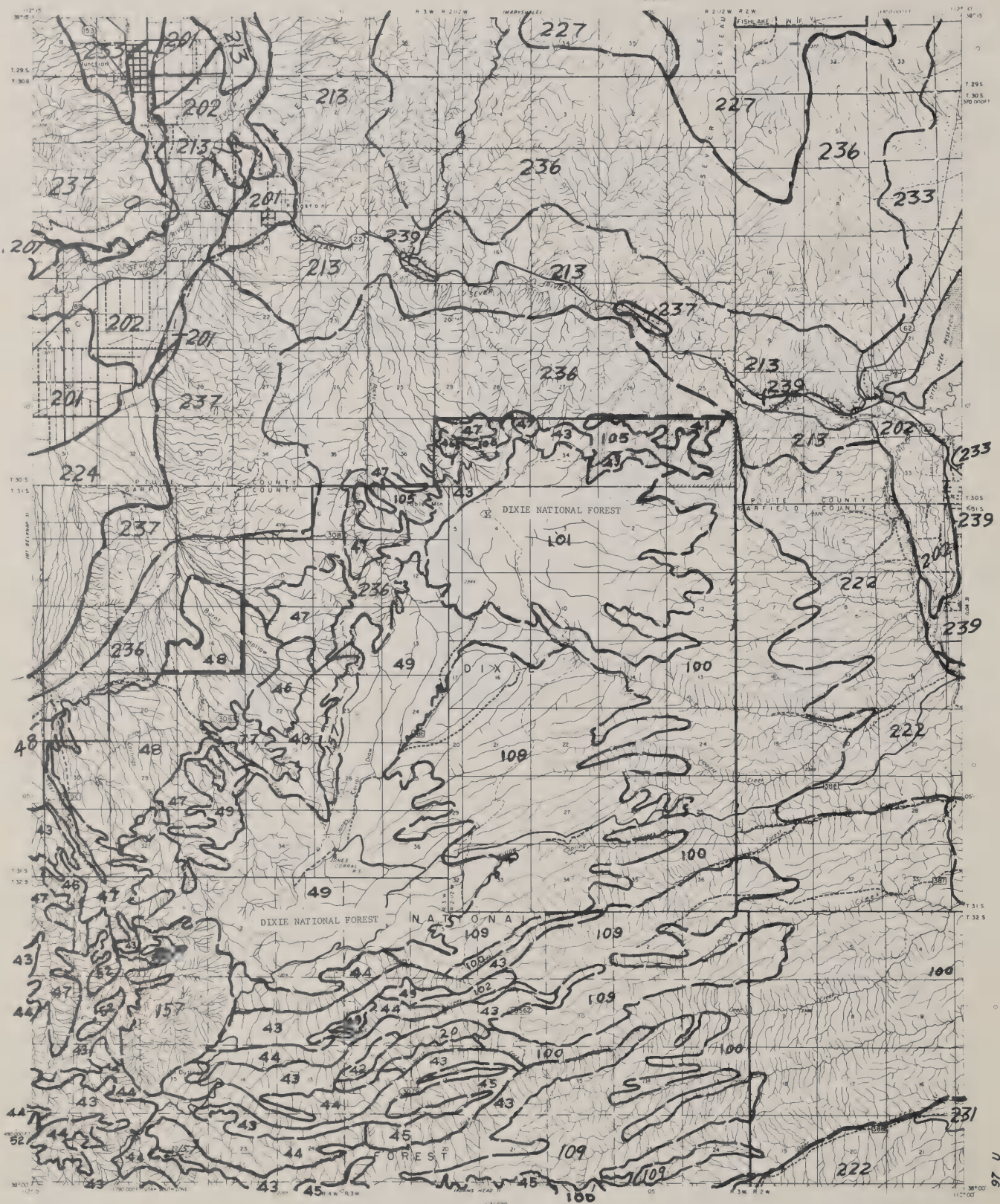


95

LOA 4, UTA
DIXIE N.F.

38° 00' - 39° 00' N
114° 45' - 115° 30' W

USGS Photometric Survey Map
Data: United States Geological Survey
Scale: 1:50,000
Projection: UTM
Datum: NAD 83
Elevation: 1984



USGS, Springfield, Vt. Map
Compiled by the U.S. Geological Survey
from Aerial Photographs, 1947-1954
Topographic and Base Map, 1:50,000 Scale
1954 Edition
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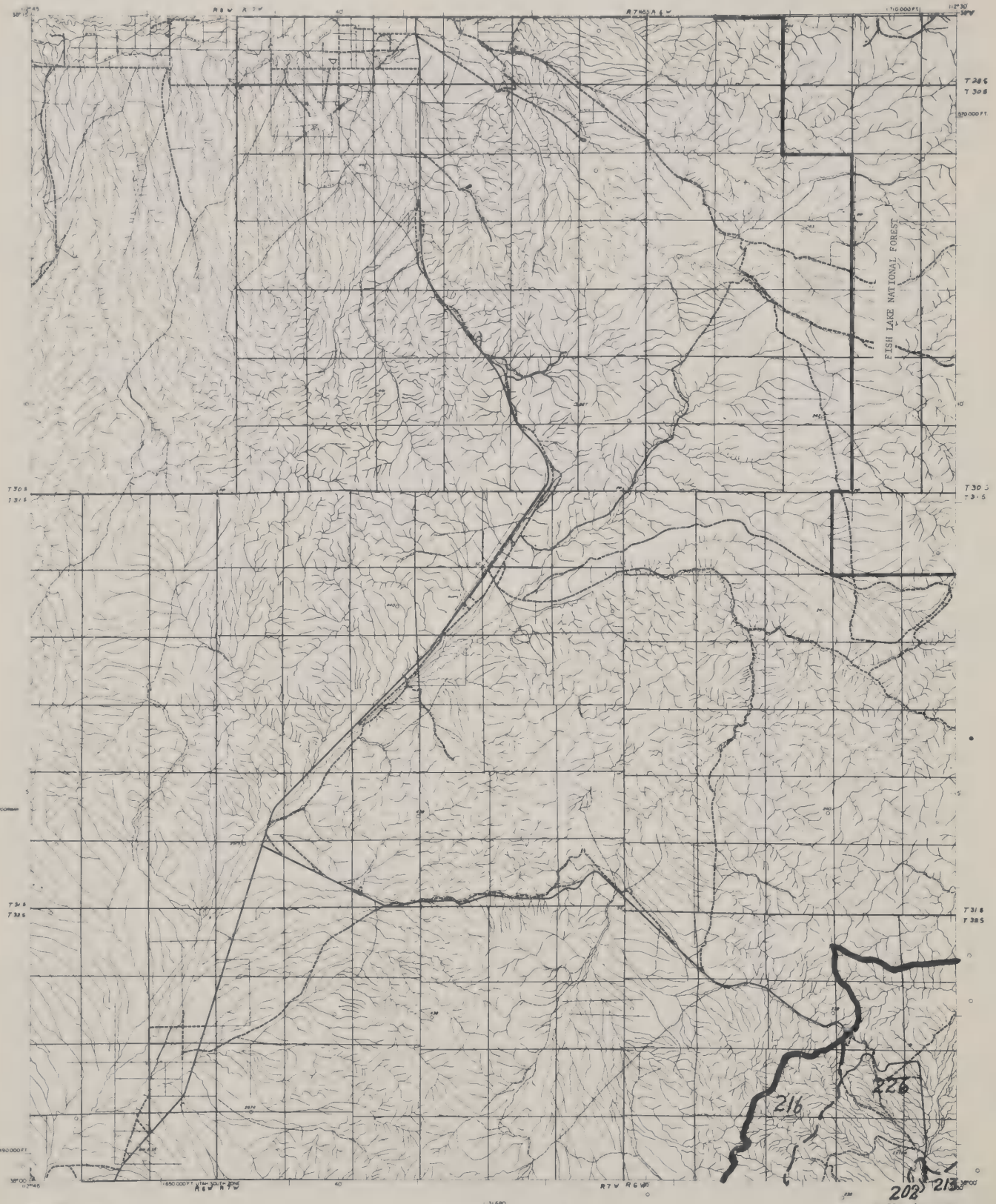
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USFS Planimeter Series Map
 Constructed by Photogrammetry
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 June 1962 Edition
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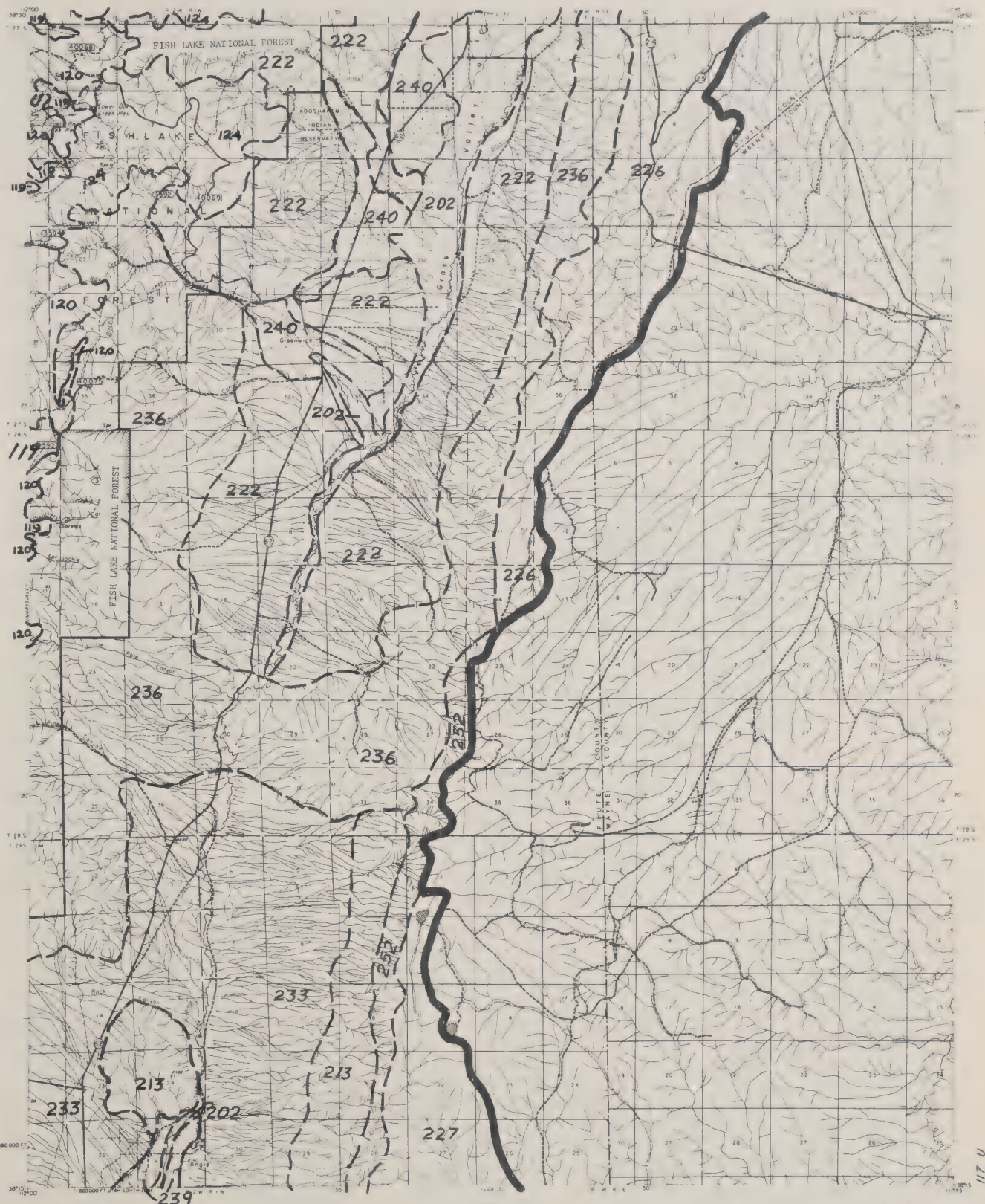
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U.S. Department of the Interior
Bureau of Land Management
Washington, D.C. 20250
Map of Fish Lake National Forest
Scale 1:50,000
Published 1984

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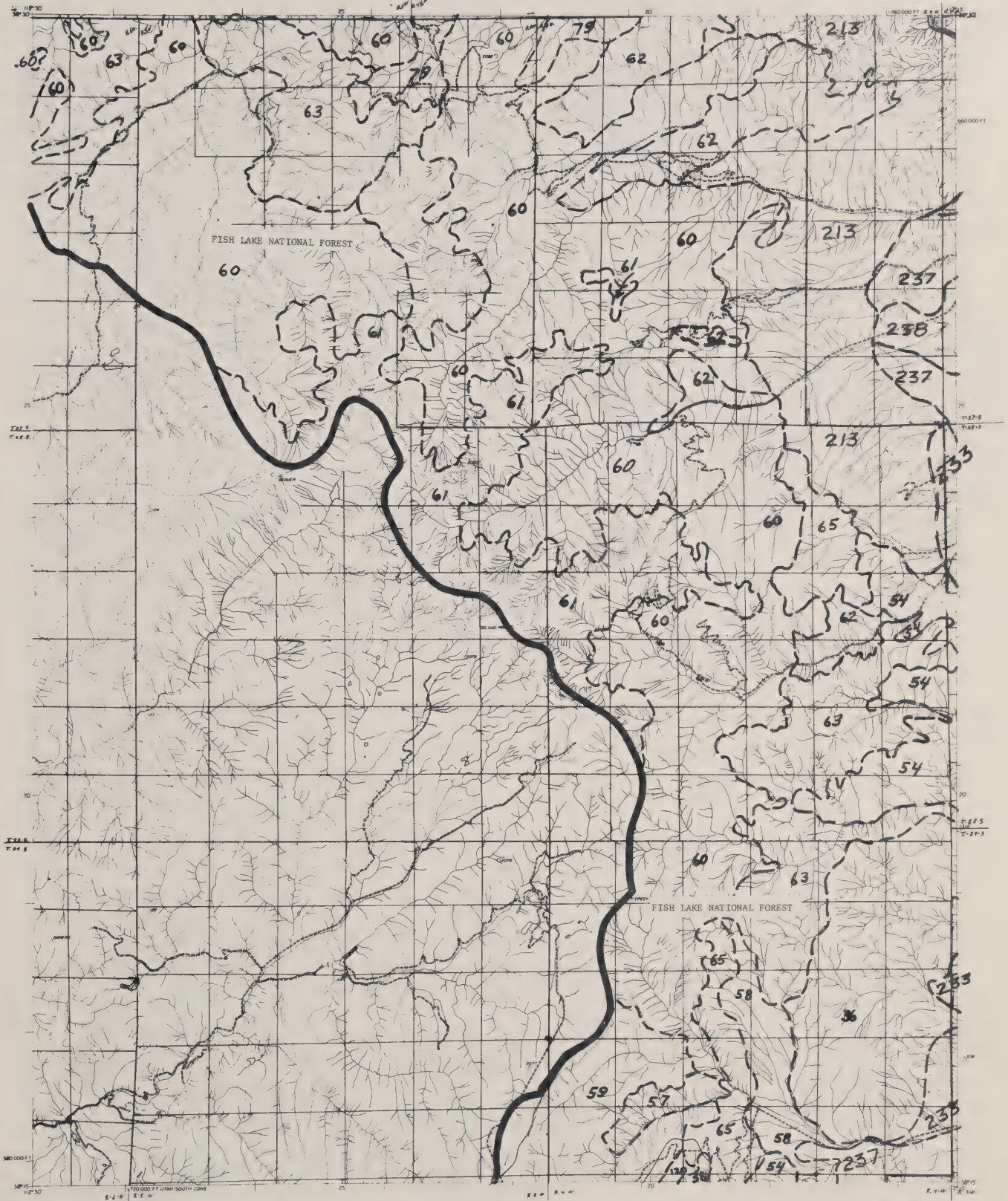
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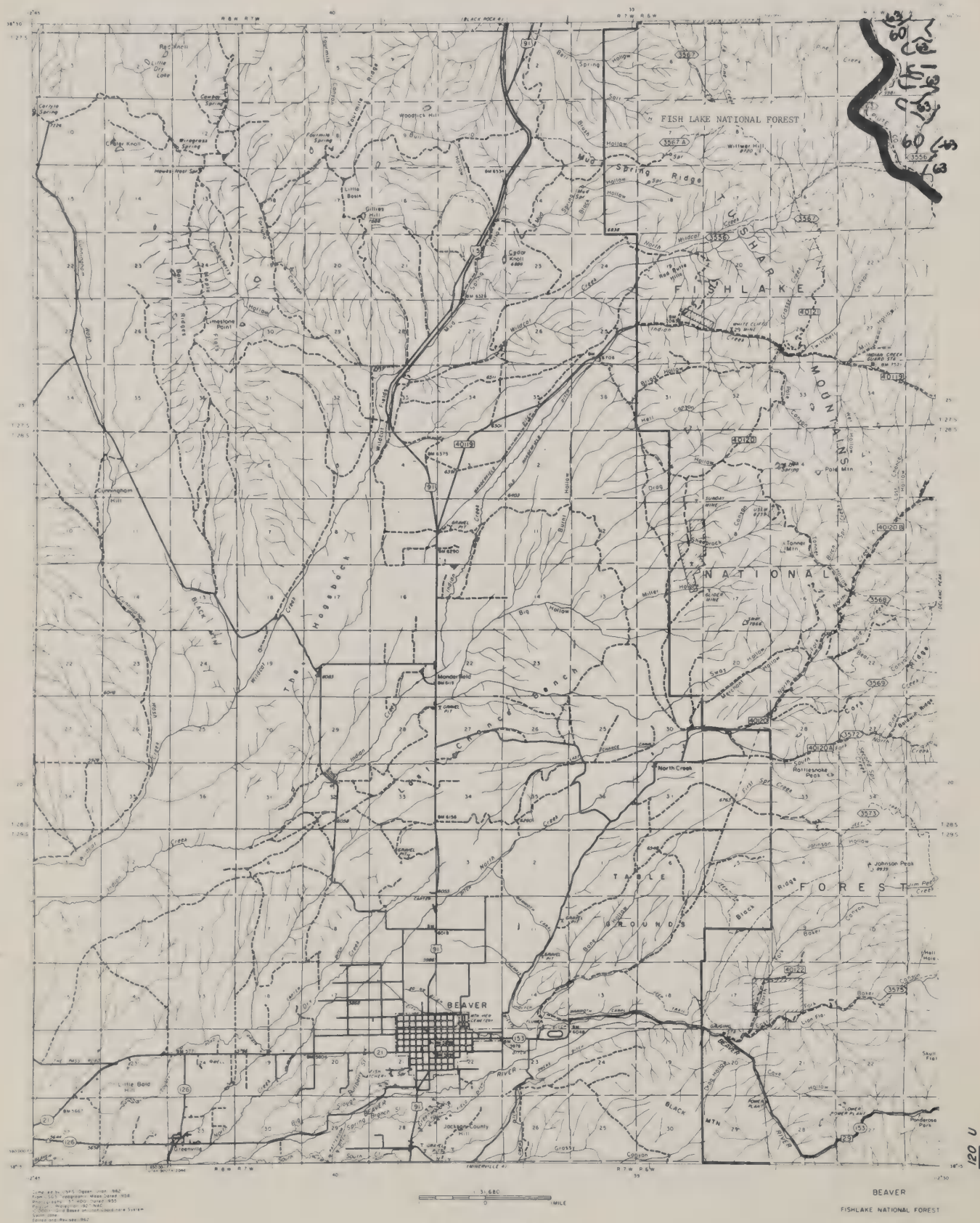


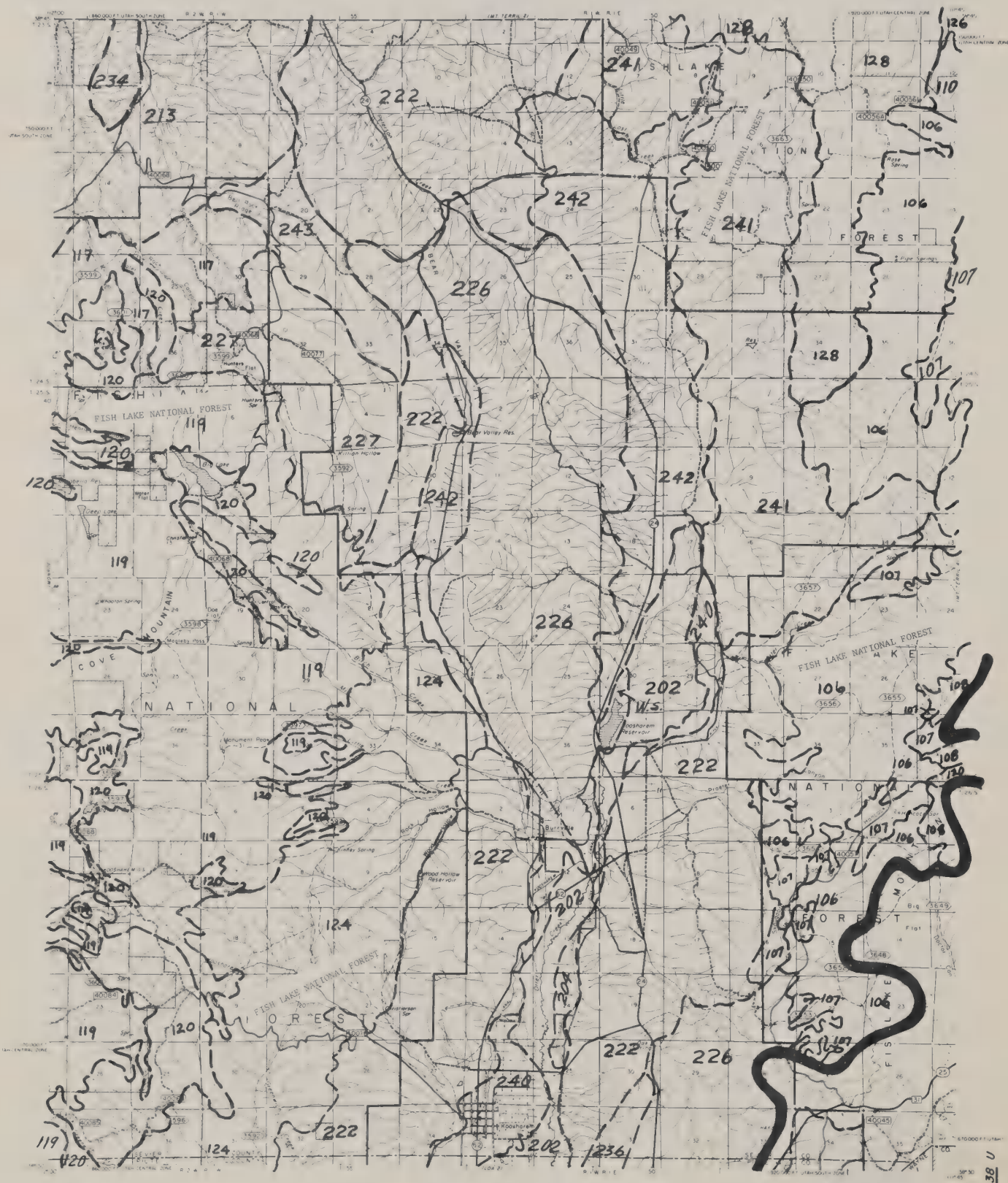
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Compiled by Photogrammetric Methods
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Scale 1:50,000
Datum: 1929
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Datum: 1929
Projection: UTM
Zone: 12N



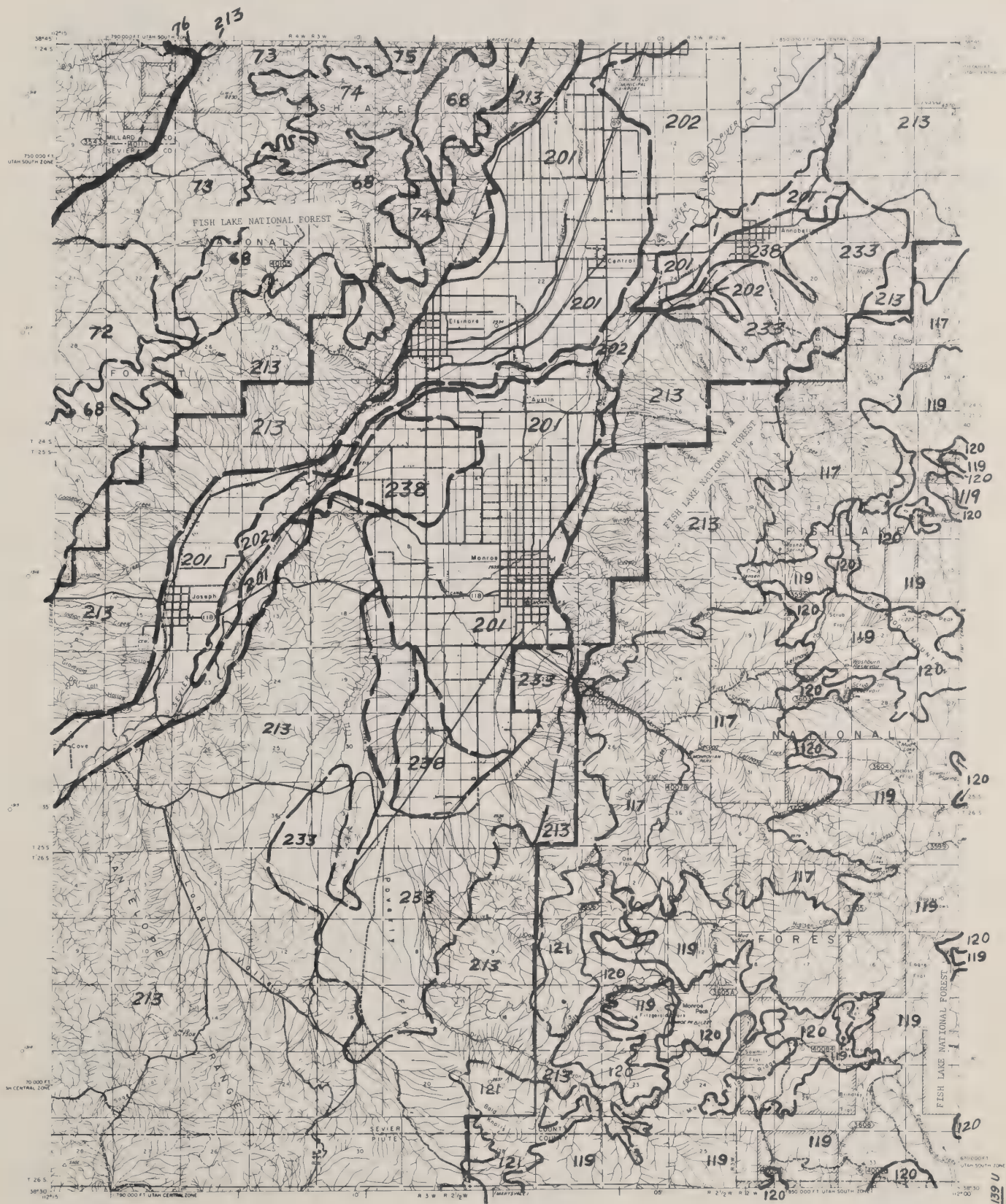
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FISH LAKE NATIONAL FOREST
38°00' - 40°00' N
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U.S. Geological Survey
 Compiled by Photogrammetric Methods
 From 60,000 Photographs, 1953
 Photogrammetric Map, 1:50,000
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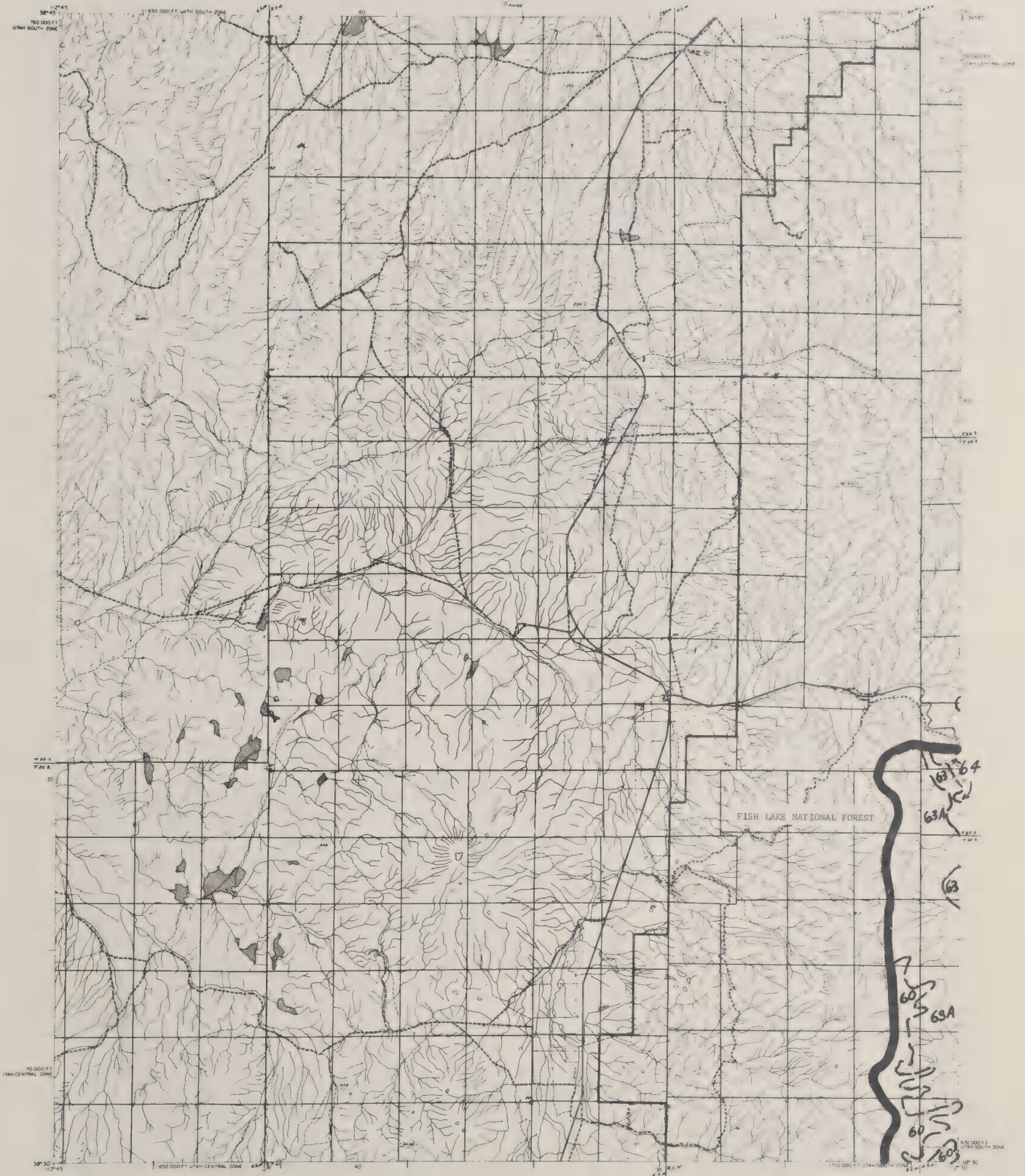
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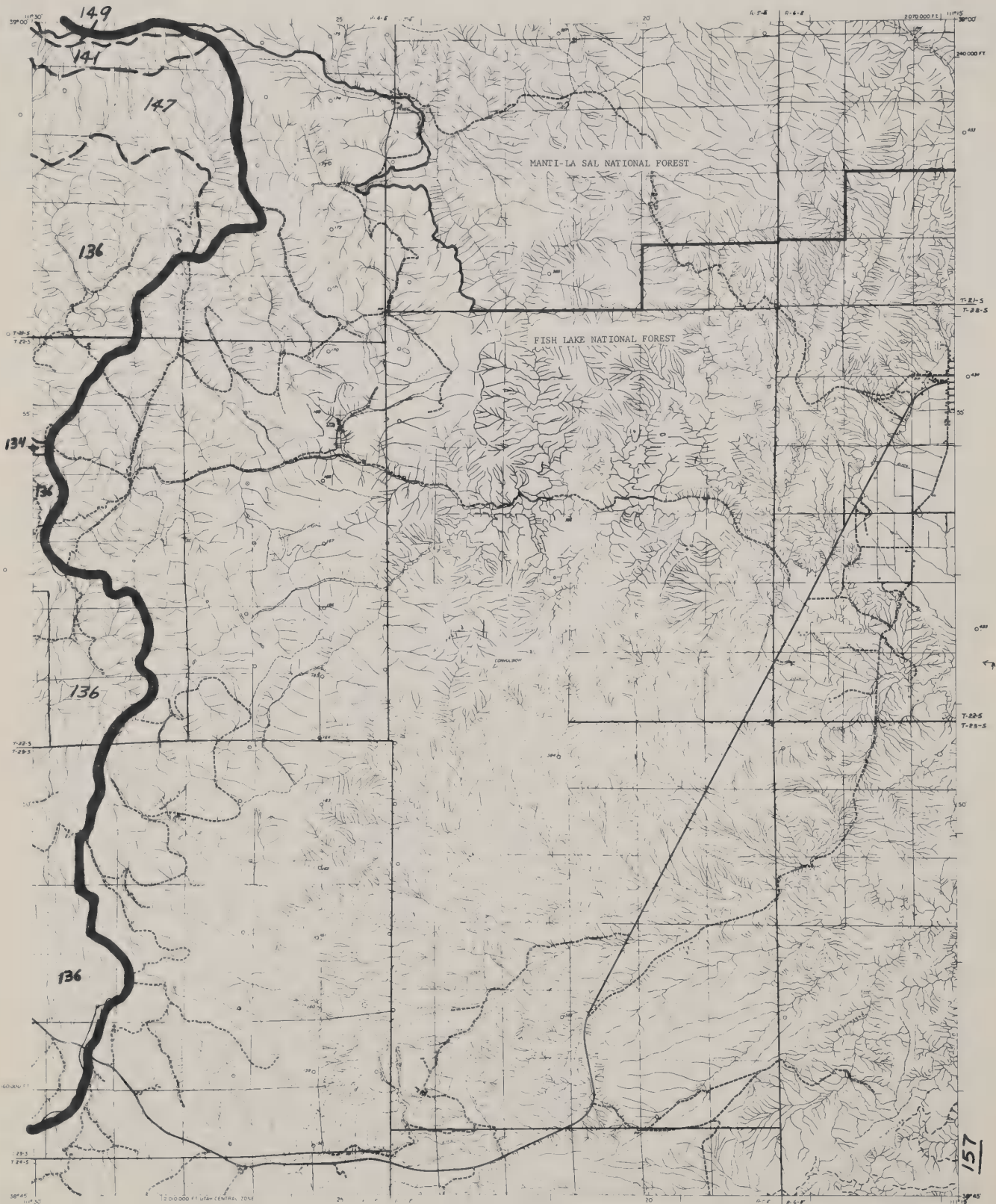
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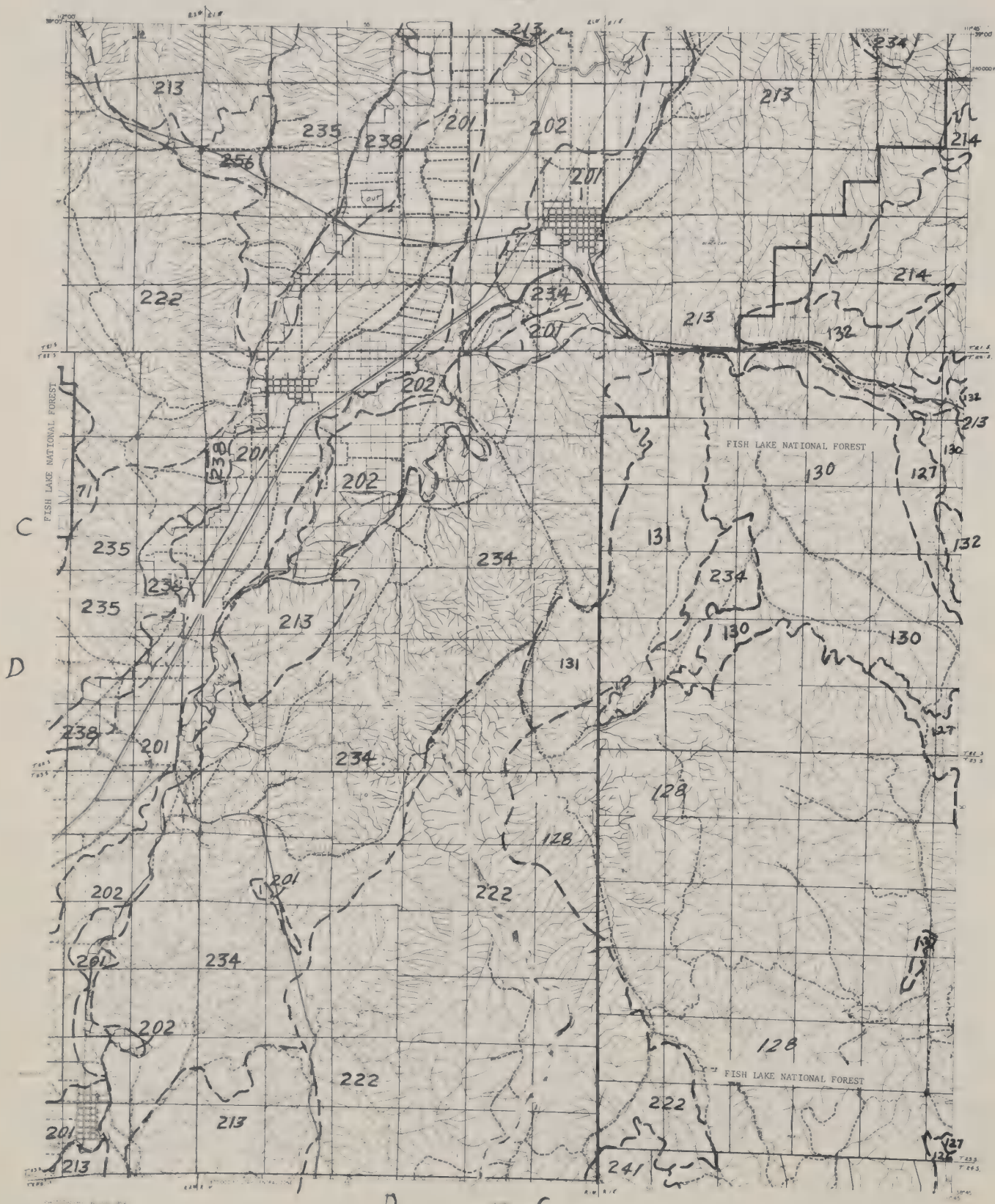
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USGS Photographic Series Map
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Scale: 1:62,500
Projection: UTM
Datum: NAD 83
Elevation: 1000 feet
Source: Aerial Photographs
Date: 1987

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RICHFIELD 1
FISH LAKE NATIONAL FOREST

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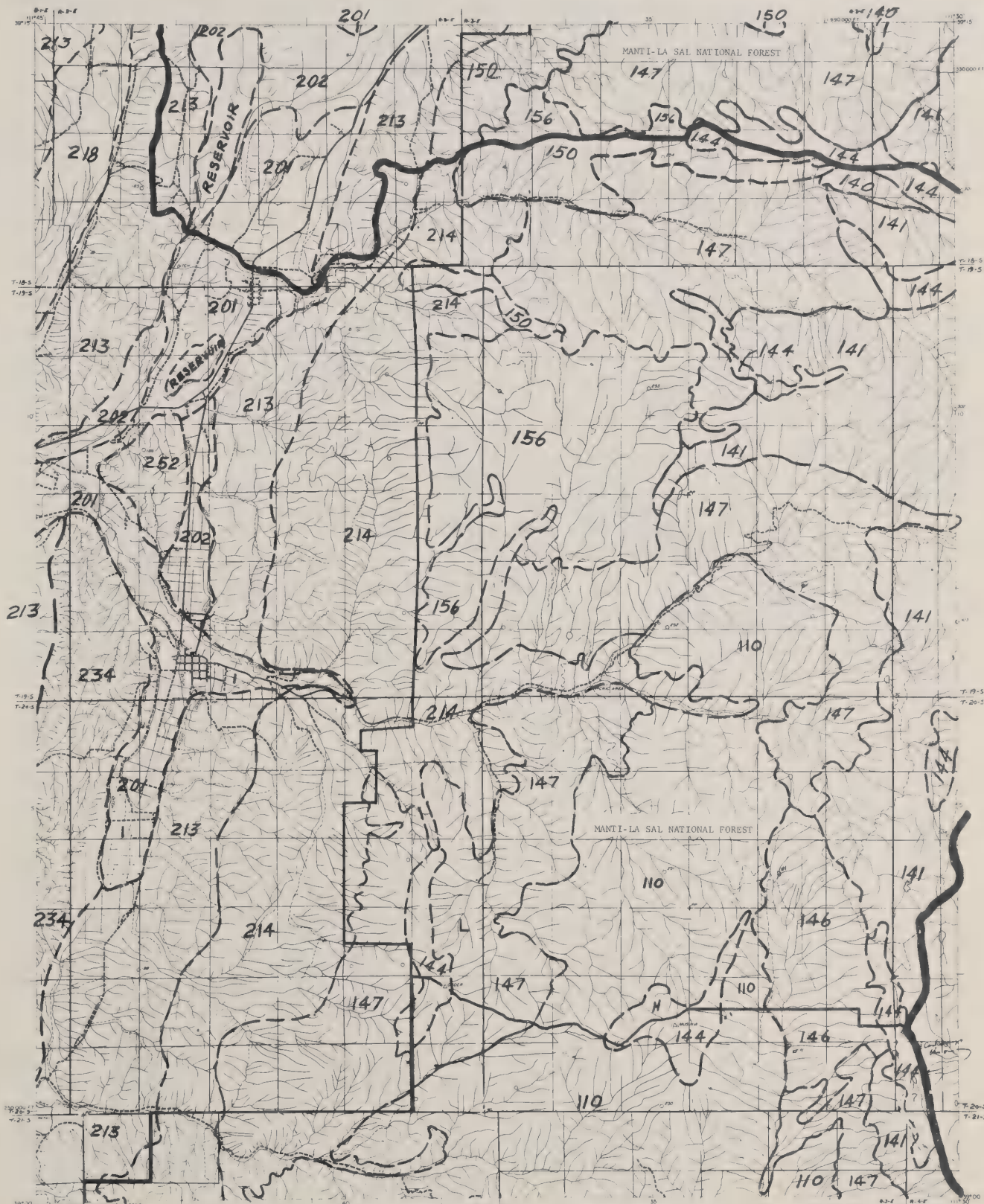
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PHOTOGRAPH: 60000, 1954-55
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PHOTOGRAPHY - 60000 - 9504
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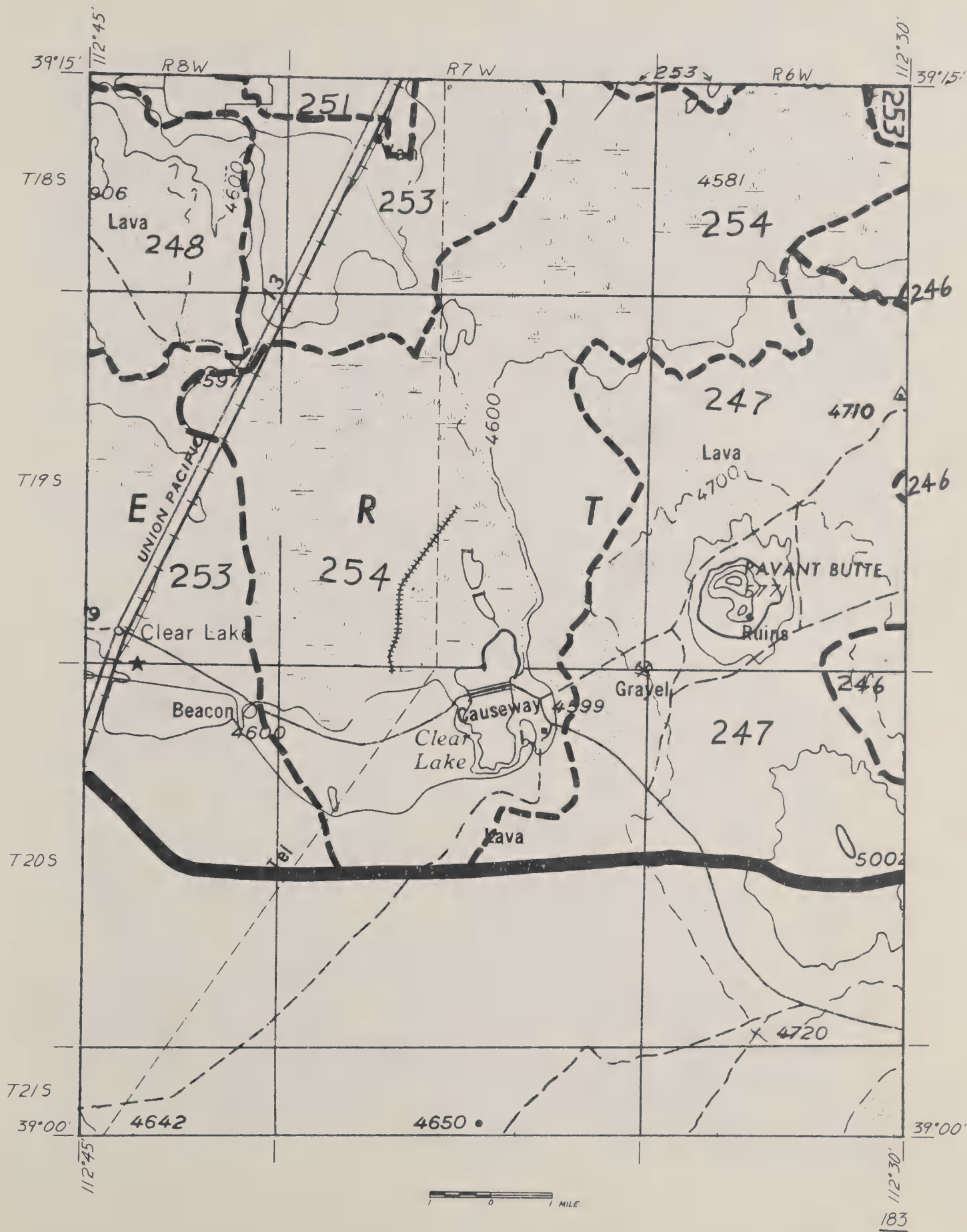
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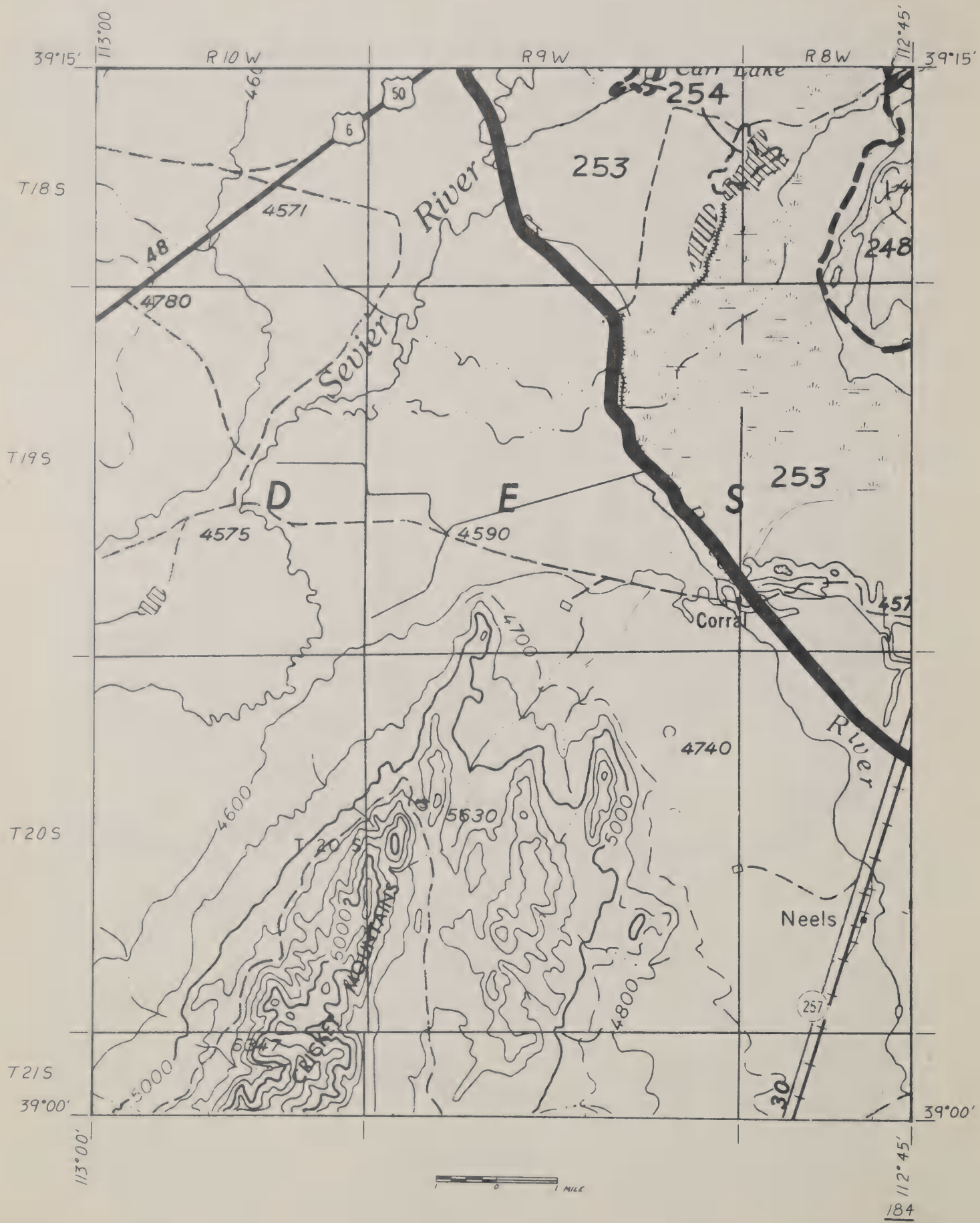


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FISH LAKE NATIONAL FOREST

182

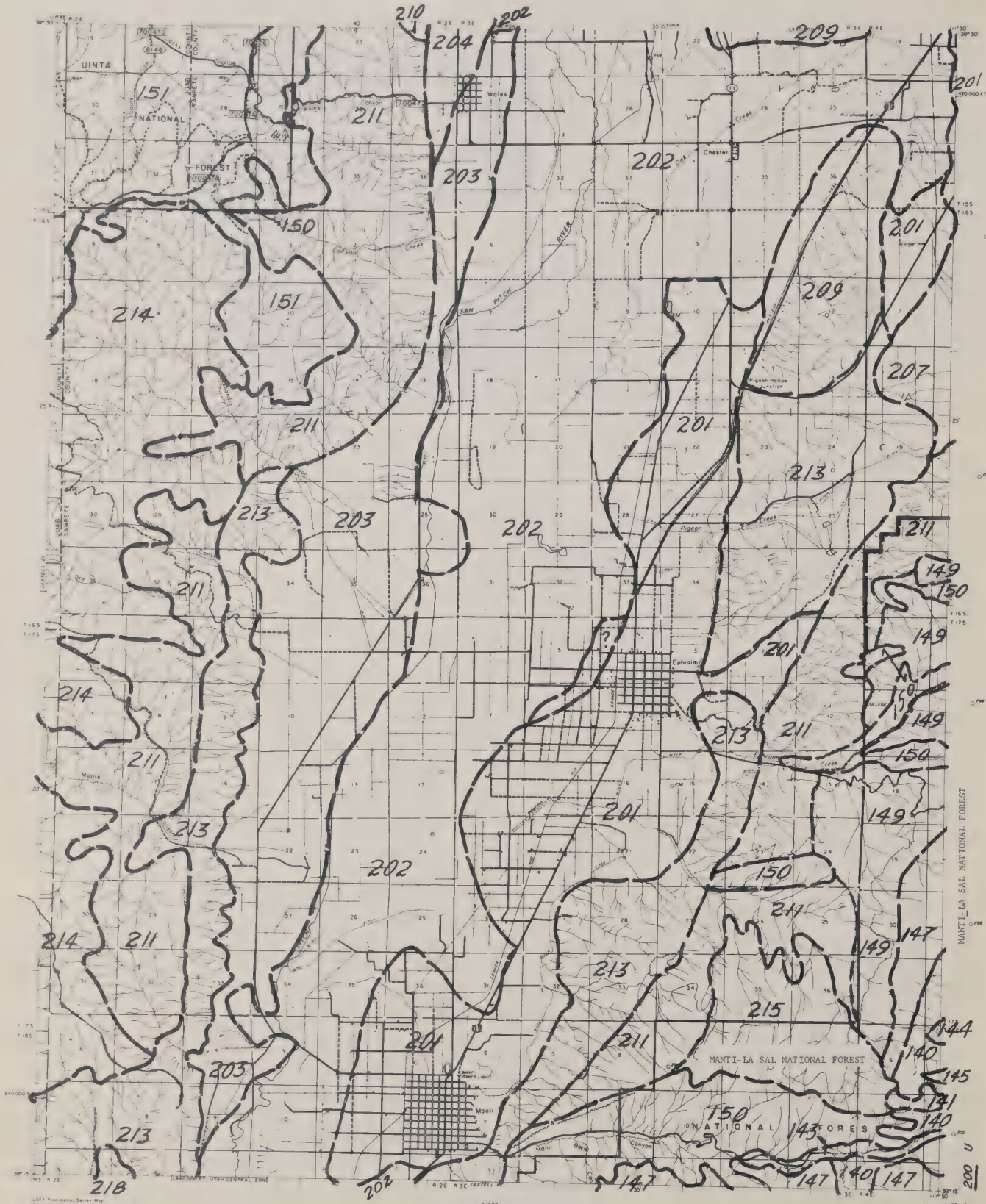






PHOTOGRAPHY 1:60,000, 1954-55
MANUSCRIPT 1961

SOUTH TENT, UTAH
FISHLAKE PROJECT
199 U



MANTI-LA SAL NATIONAL FOREST

USGS Photographic Series Map
Photoreproduction of original map
Scale: 1 inch = 1 mile
Projection: UTM
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Elevation: 1000 feet
Map Date: 1982

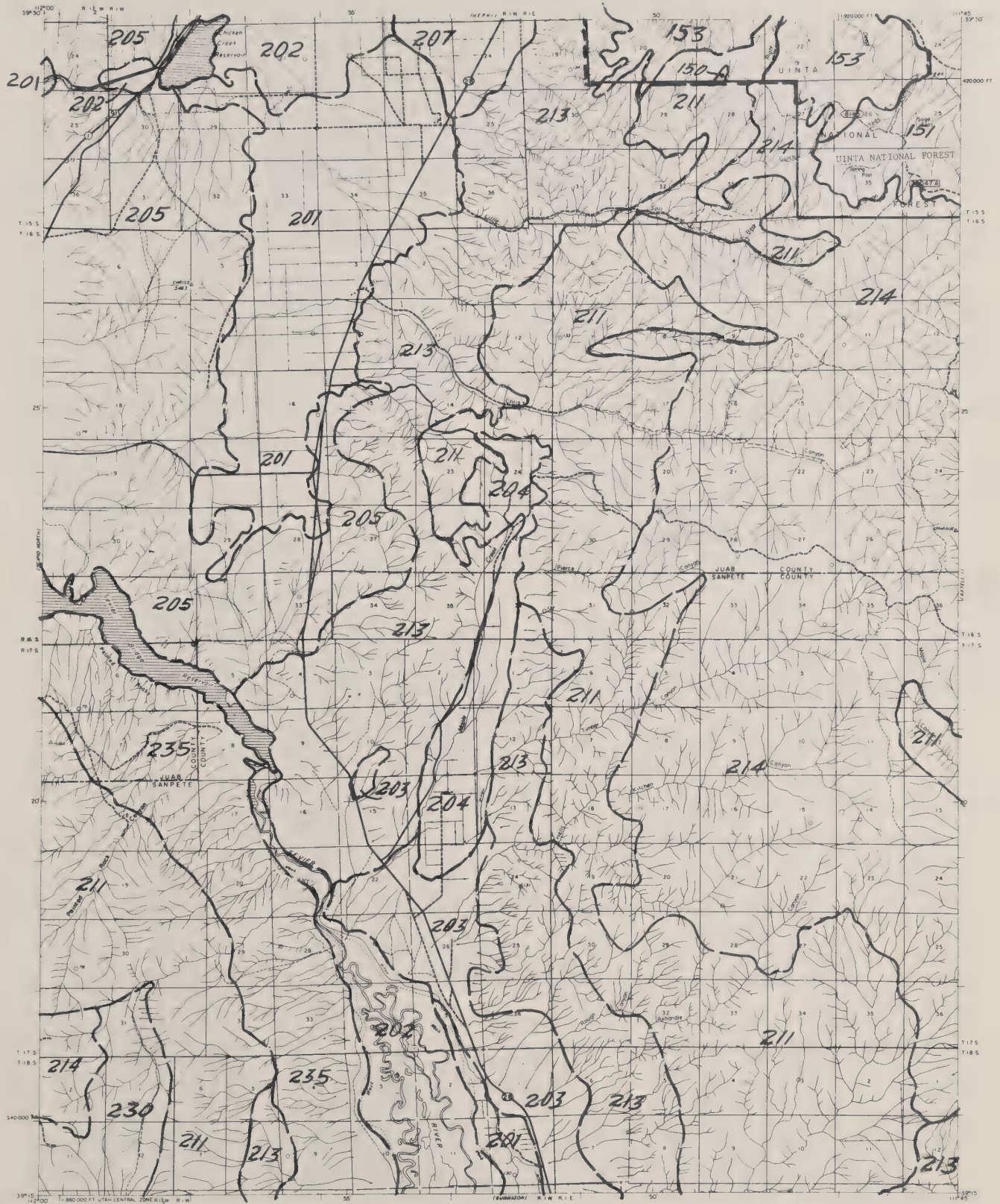
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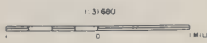
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U.S. Planning Series Map
Contouring by Photogrammetric methods
Plan: 450,000 Horizontal Control: 1955
Projection: Polyconic 1927 NAD
Datum: 1927 U.S. Mean Sea Level
Control Data
Cartographic Revision 1962



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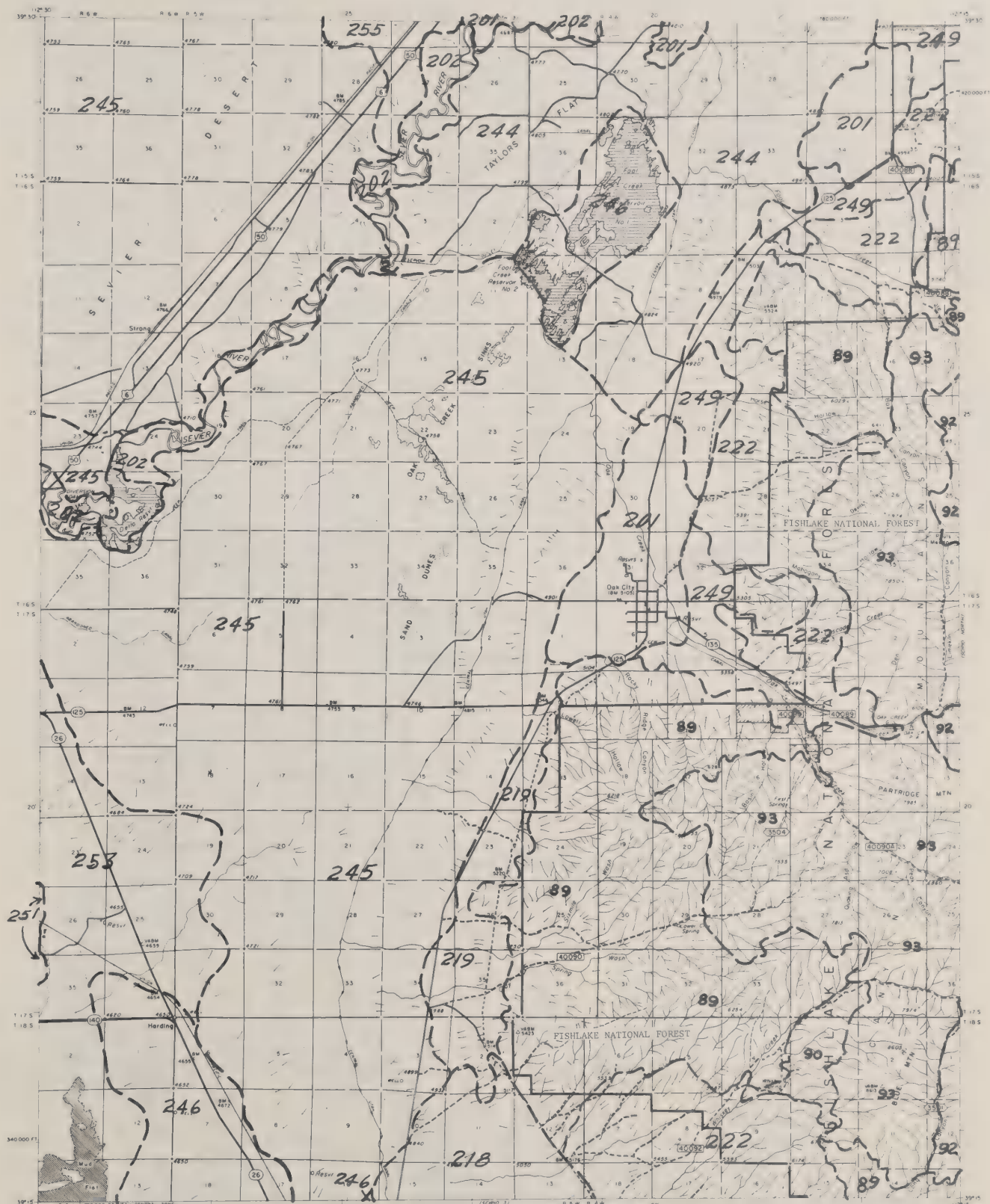
2010



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 From: U.S. Geological Survey, 1960
 Original: U.S. Geological Survey, 1960
 Scale: 1:50,000
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 This map cannot be used for planning, surveying, or other purposes.

SCIPION NORTH
 FISH LAKE NATIONAL FOREST
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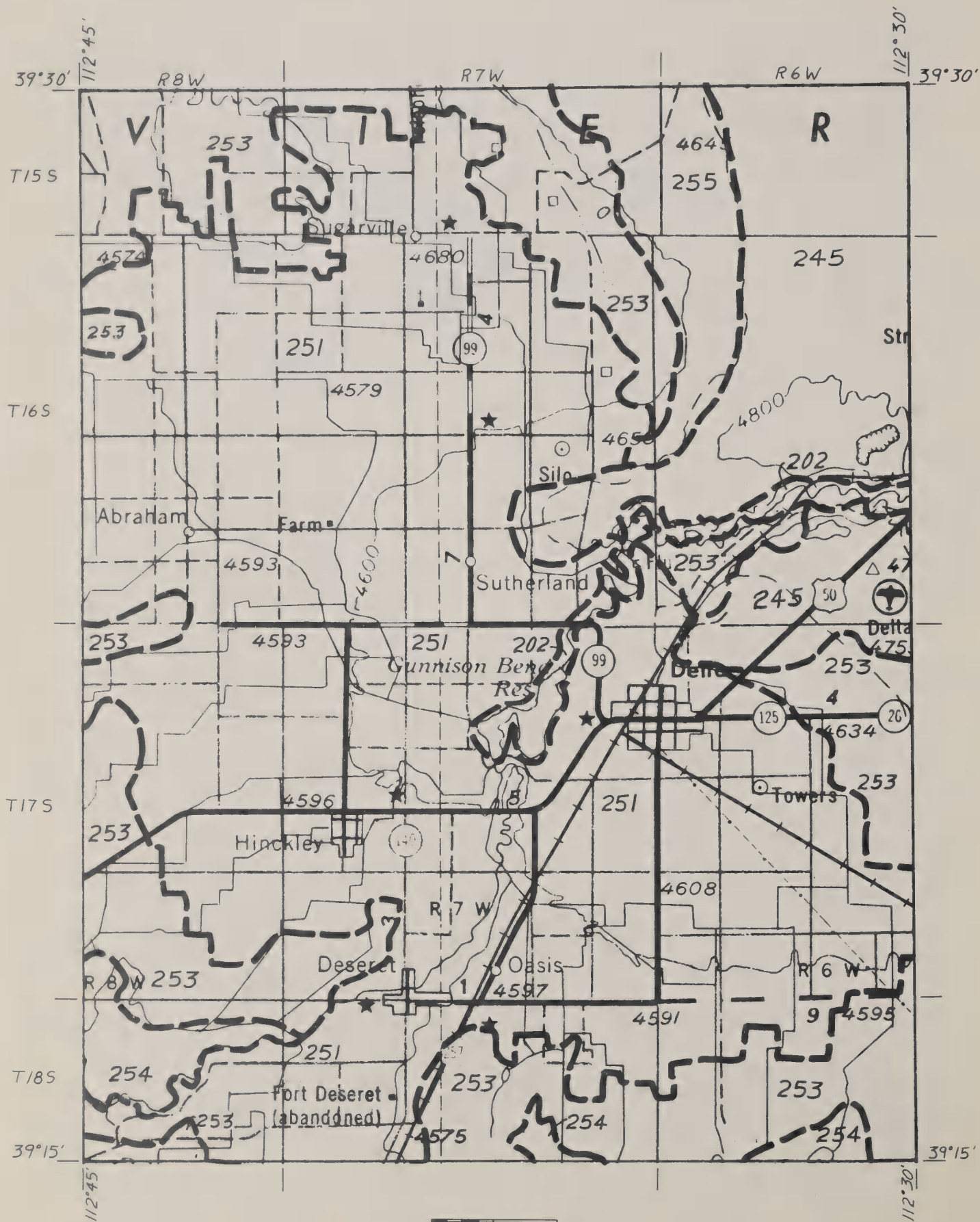
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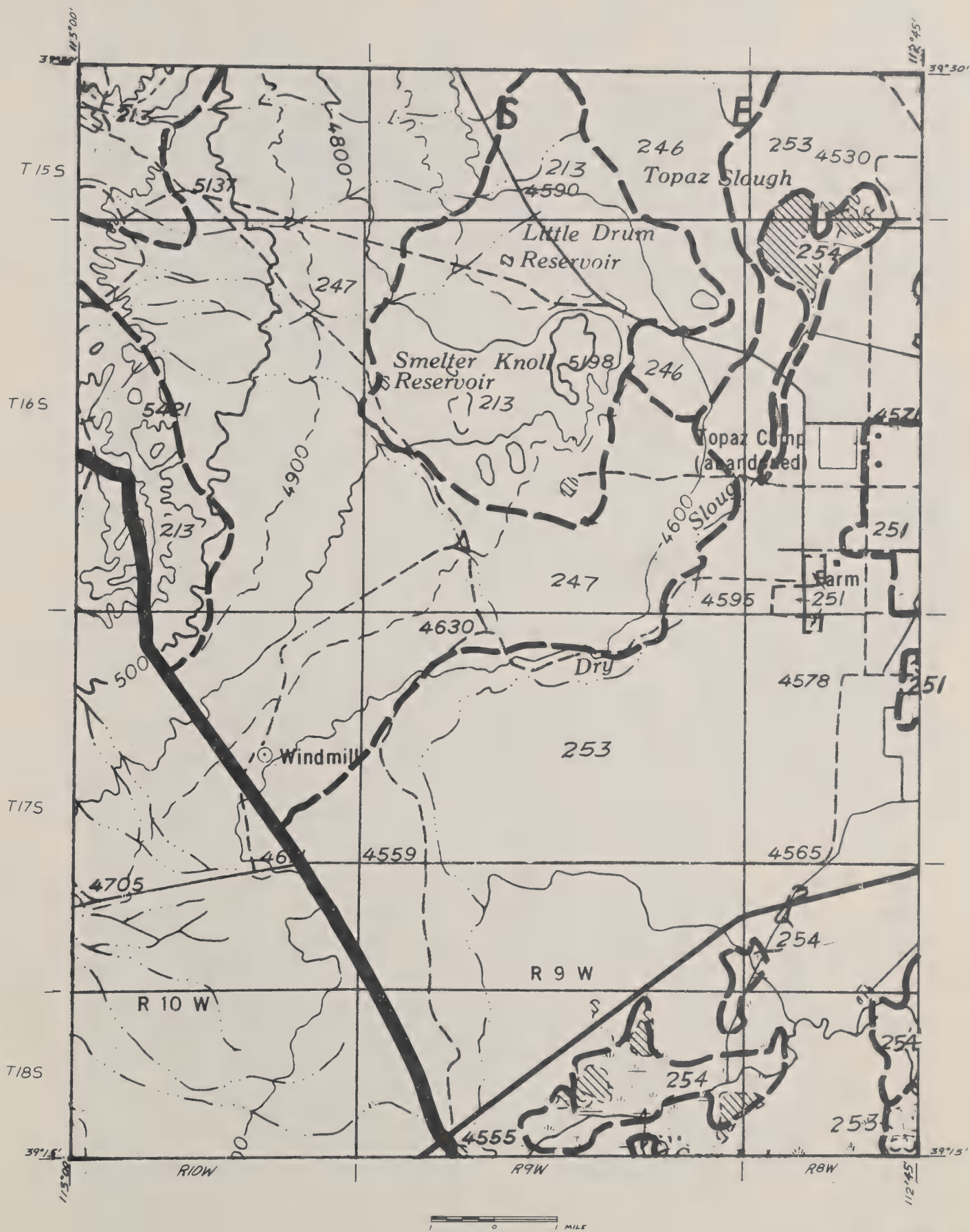
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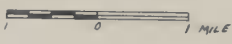
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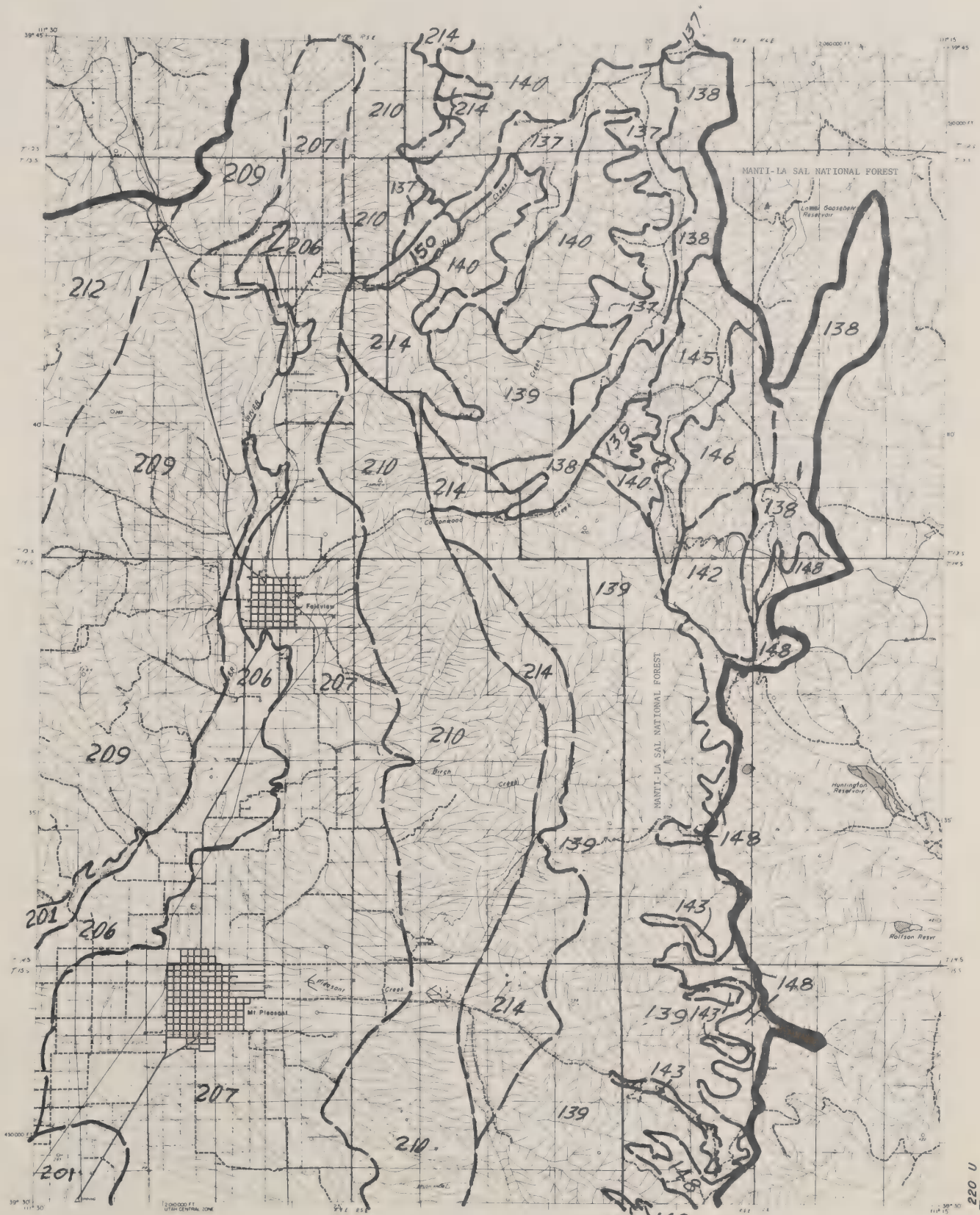
OAK CITY
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PHOTOGRAPH 1: 60000:1954-55
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PINE CROWN PEAK
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PINE CROWN PEAK
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Compiled by the Regional Cartographic Division, Albuquerque, New Mexico
September 1944, from aerial survey flown for S.C.S. in 1938-39. Symbols, SPL and COB
refer to center by U.S.C. & S.C. and Soil Conservation Service.
Land Lines from G.I.C. Survey and field identification on aerial photographs.
Modified political division, North American datum of 1927.

1. Contour interval, 100 feet, except where noted.
2. Contour interval, 50 feet, except where noted.
3. Contour interval, 25 feet, except where noted.

Scale 1:31,680 or 2" = 1 mile



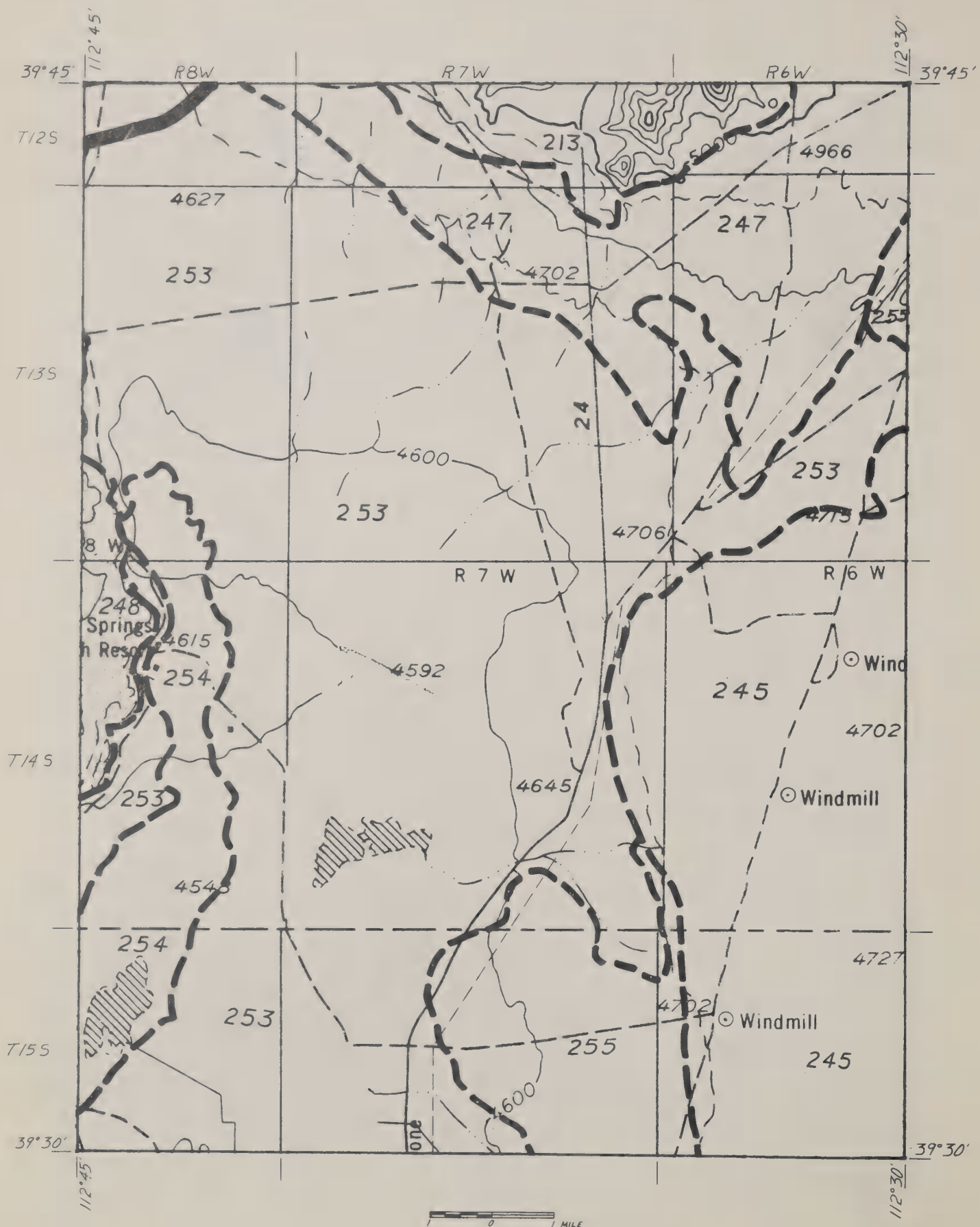
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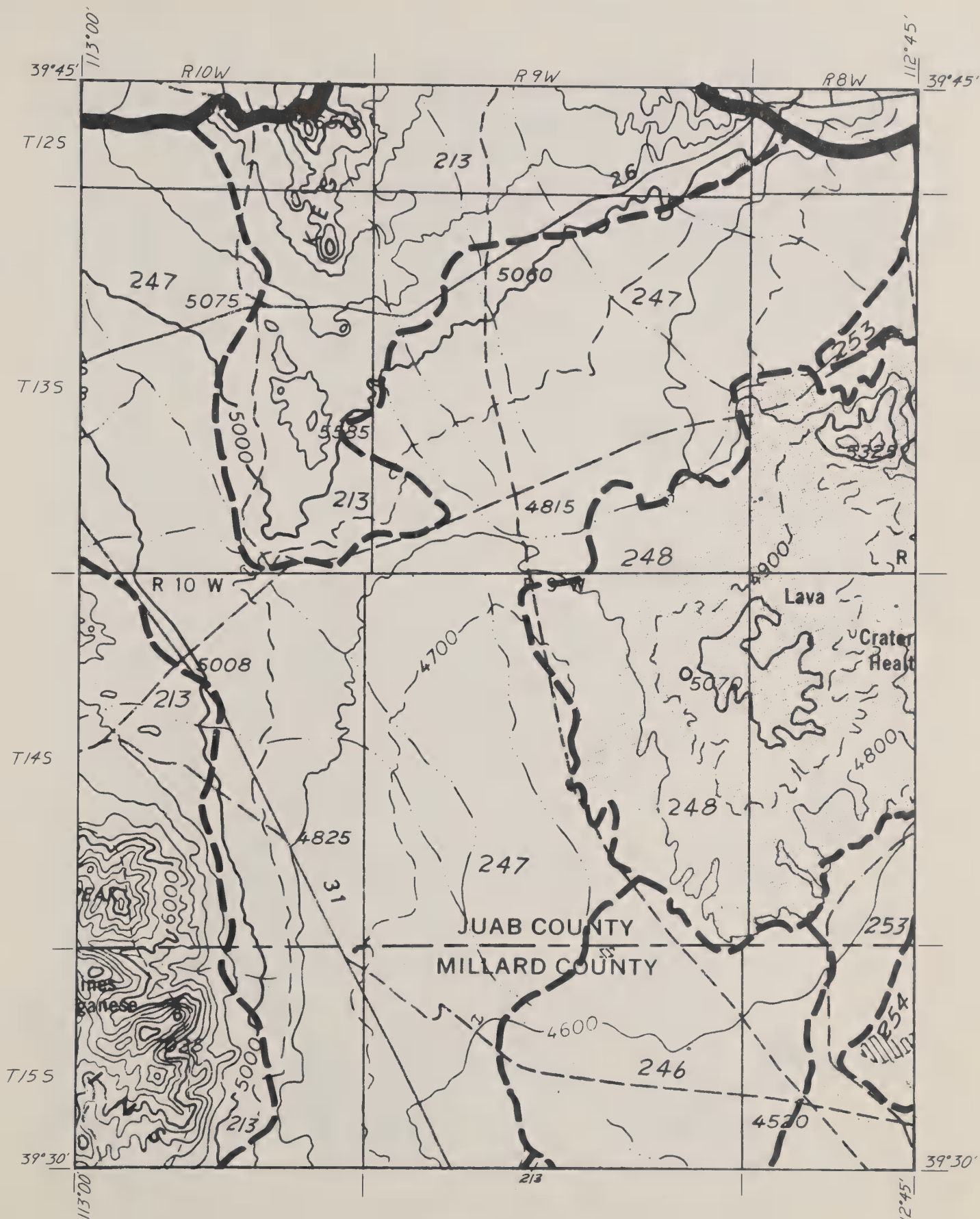
UTAH-158

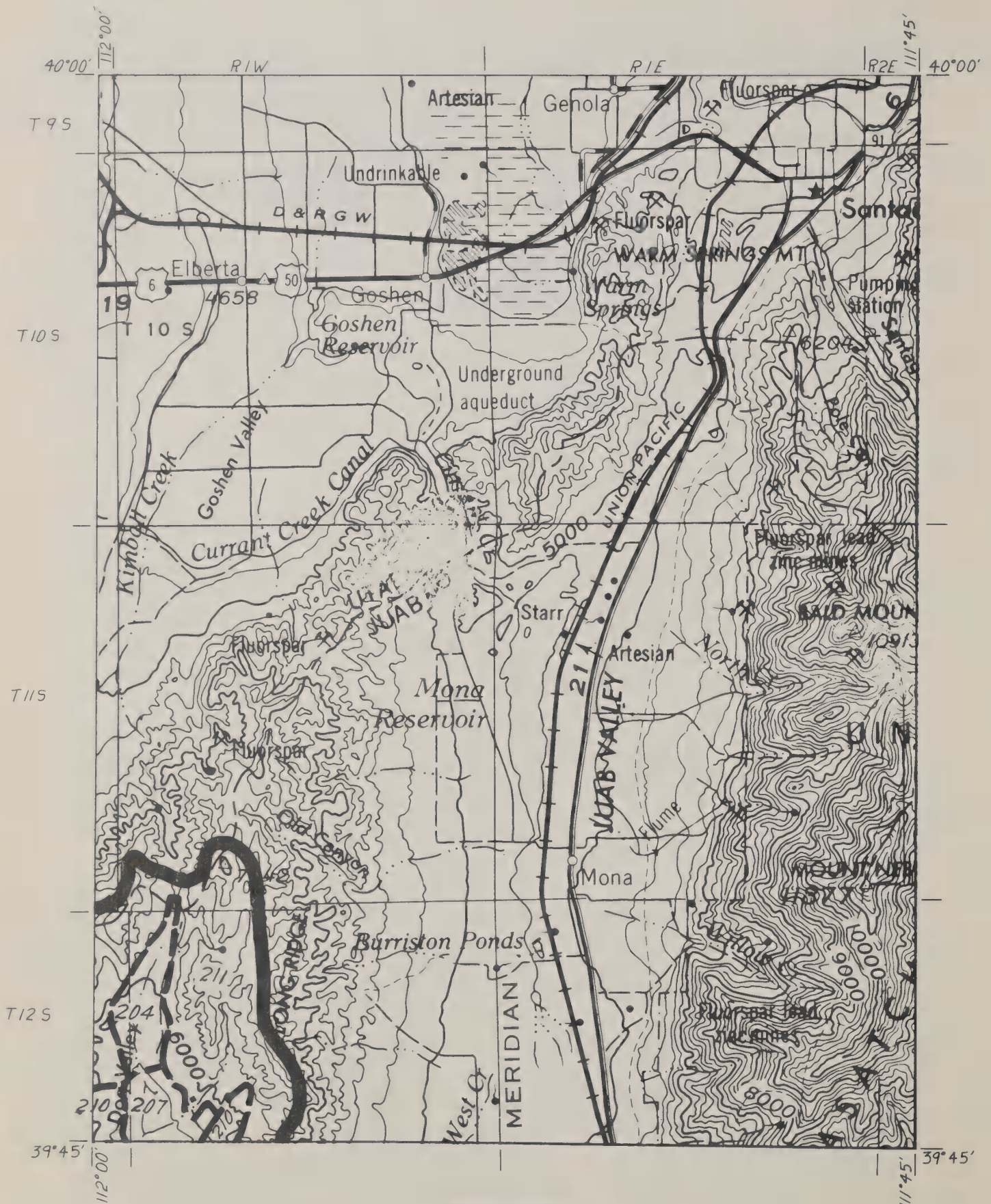
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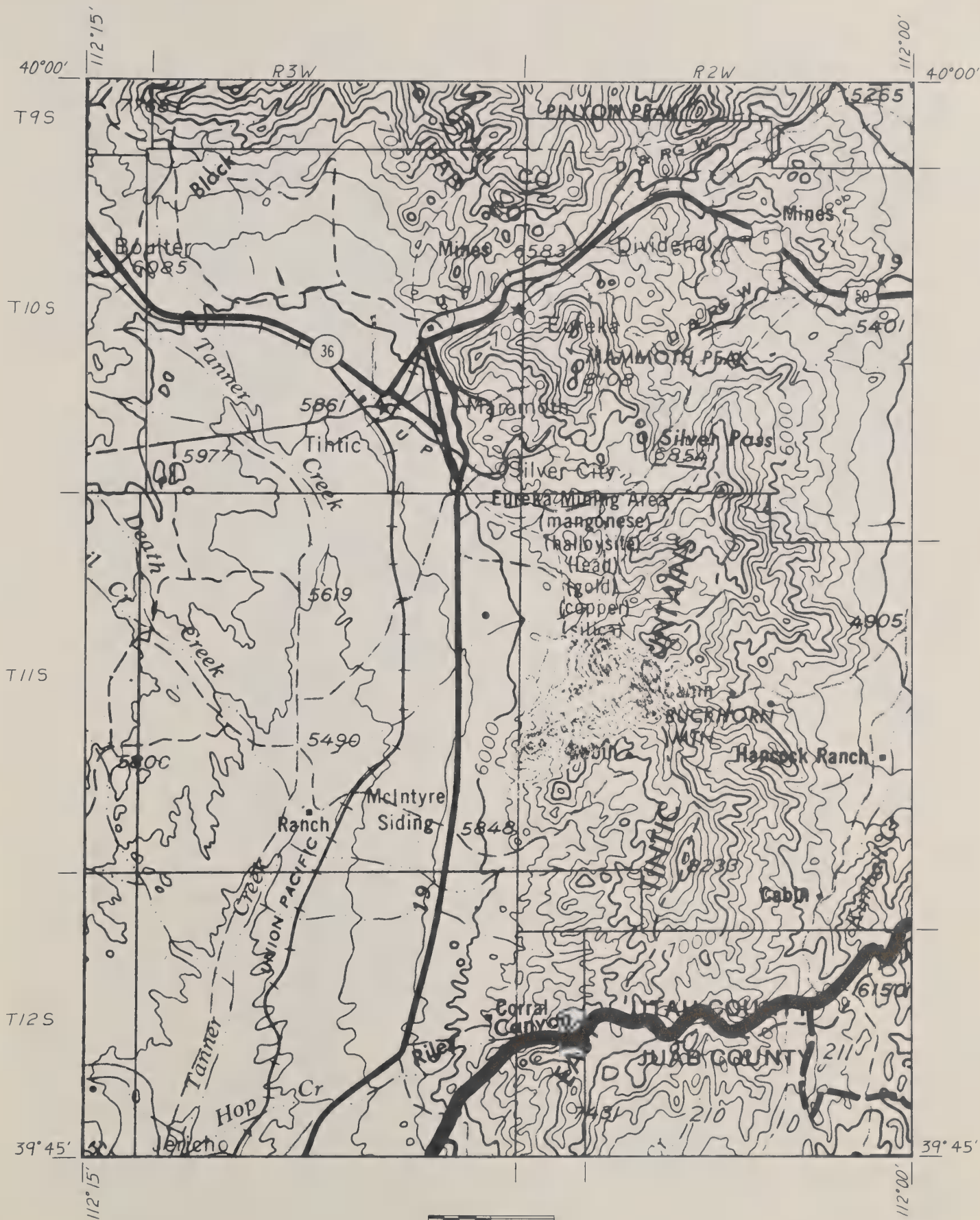




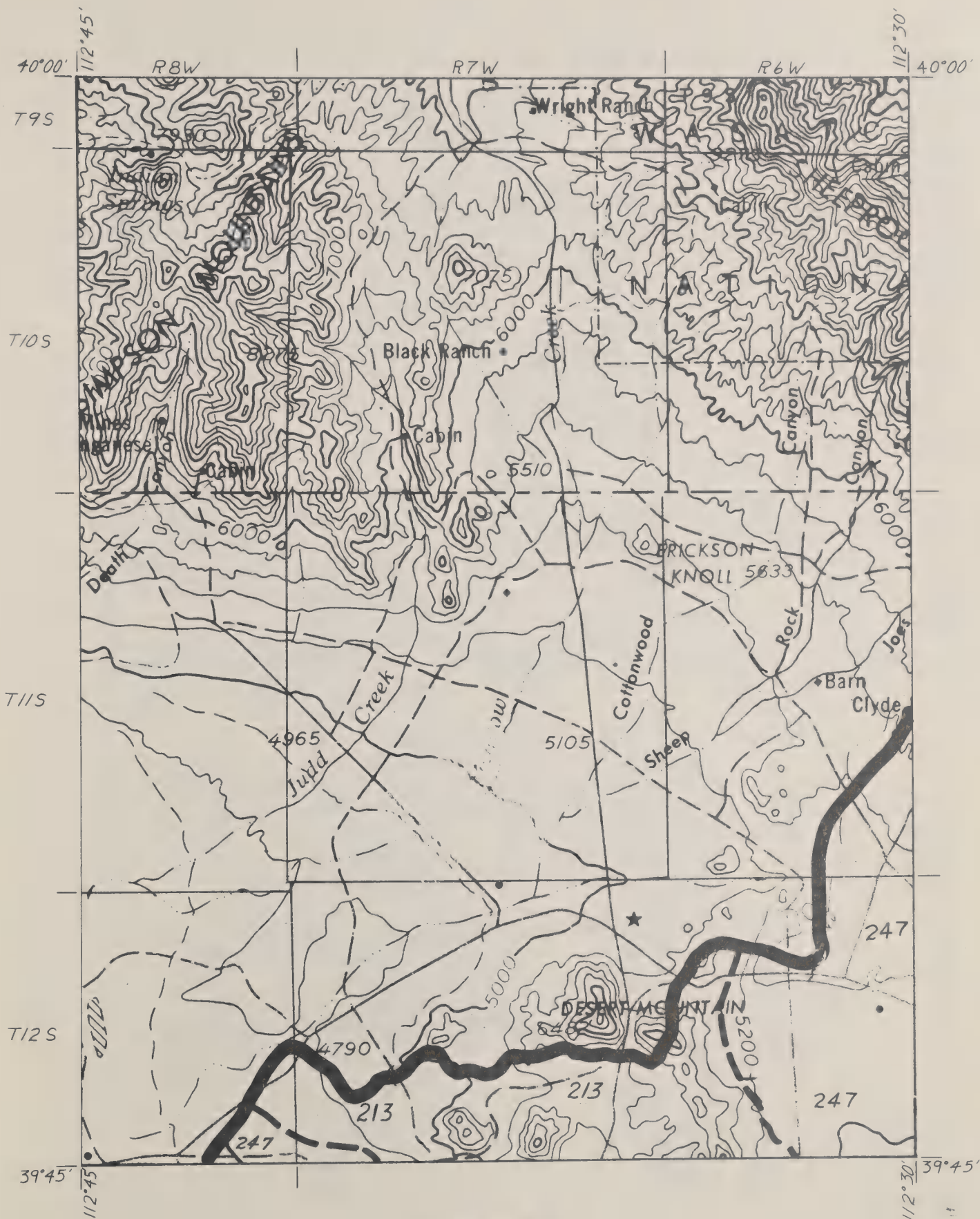


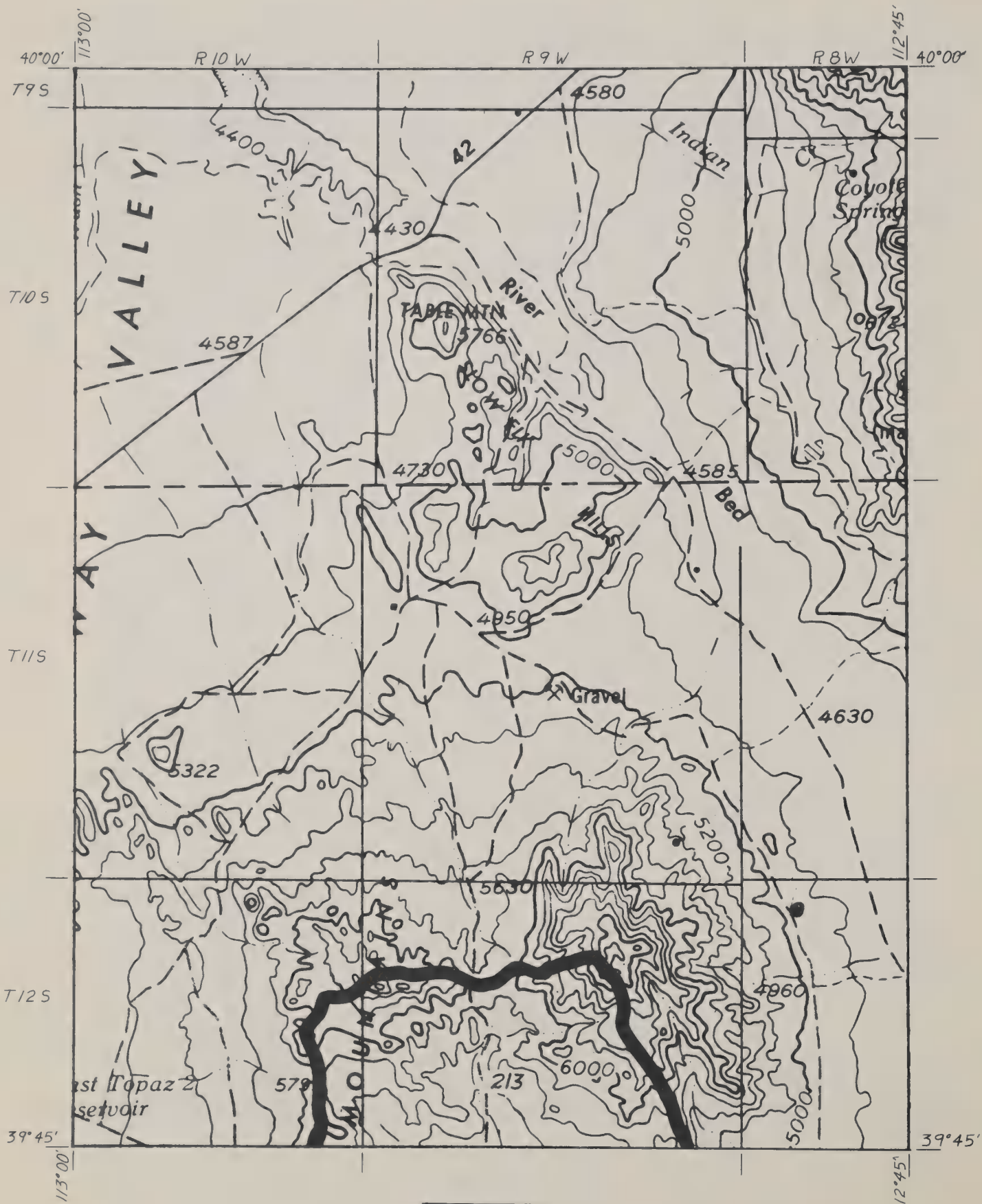












Chapter III

EROSION AND SEDIMENTATION

EROSION

Erosion is the process of removing soil from its present position by water, wind and gravity. This process has been going on since earliest geologic time as evidenced by the broad alluvial valleys and deep mountain canyons in the Sevier River Basin. Removal of protective vegetation can accelerate the process. Erosion is a complex process and is influenced by many factors, often difficult to evaluate. This section describes erosion conditions and critical area erosion. Stream channel conditions on National Forest lands are also described.

EROSION CONDITIONS

Erosion conditions were mapped from information in National Forest Range Allotment Analysis surveys and Bureau of Land Management Range Condition surveys. These surveys were coordinated, along with data developed during this investigation, to produce the information shown in Table 1 and Map 13.¹

Four broad classifications of erosion conditions were delineated. Cultivated, lava flows and water areas were not evaluated. Cultivated lands may include all or none of the four classifications. These classifications are:

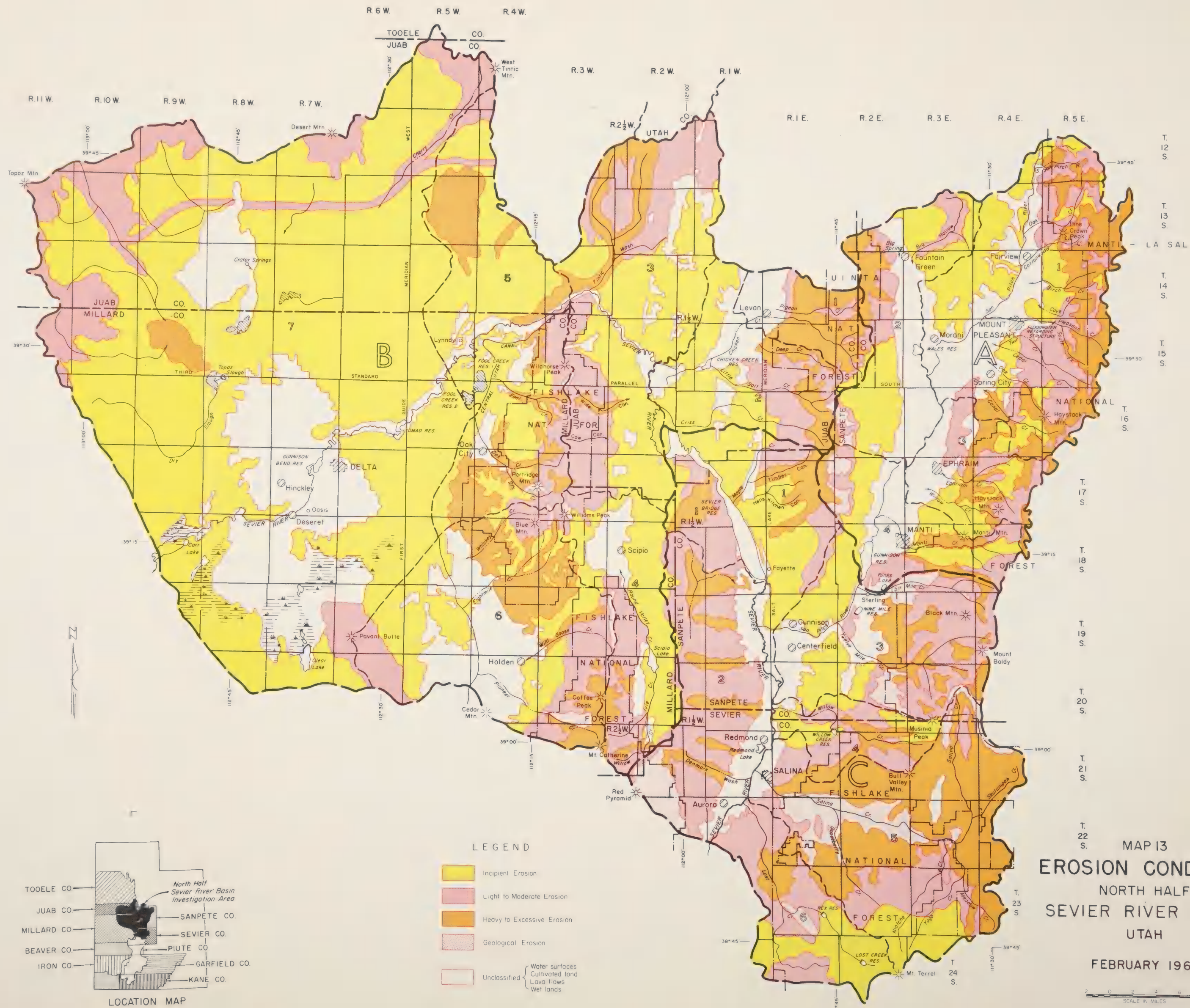
Incipient erosion: No erosion to some cutting in channels. Sheet erosion in beginning stages evidenced by light hummocking and some soil accumulation behind debris and vegetation. Plant and litter cover thin enough (50 percent to 80 percent) that the soil is not fully protected. Areas of wind erosion and sand dunes may be present.

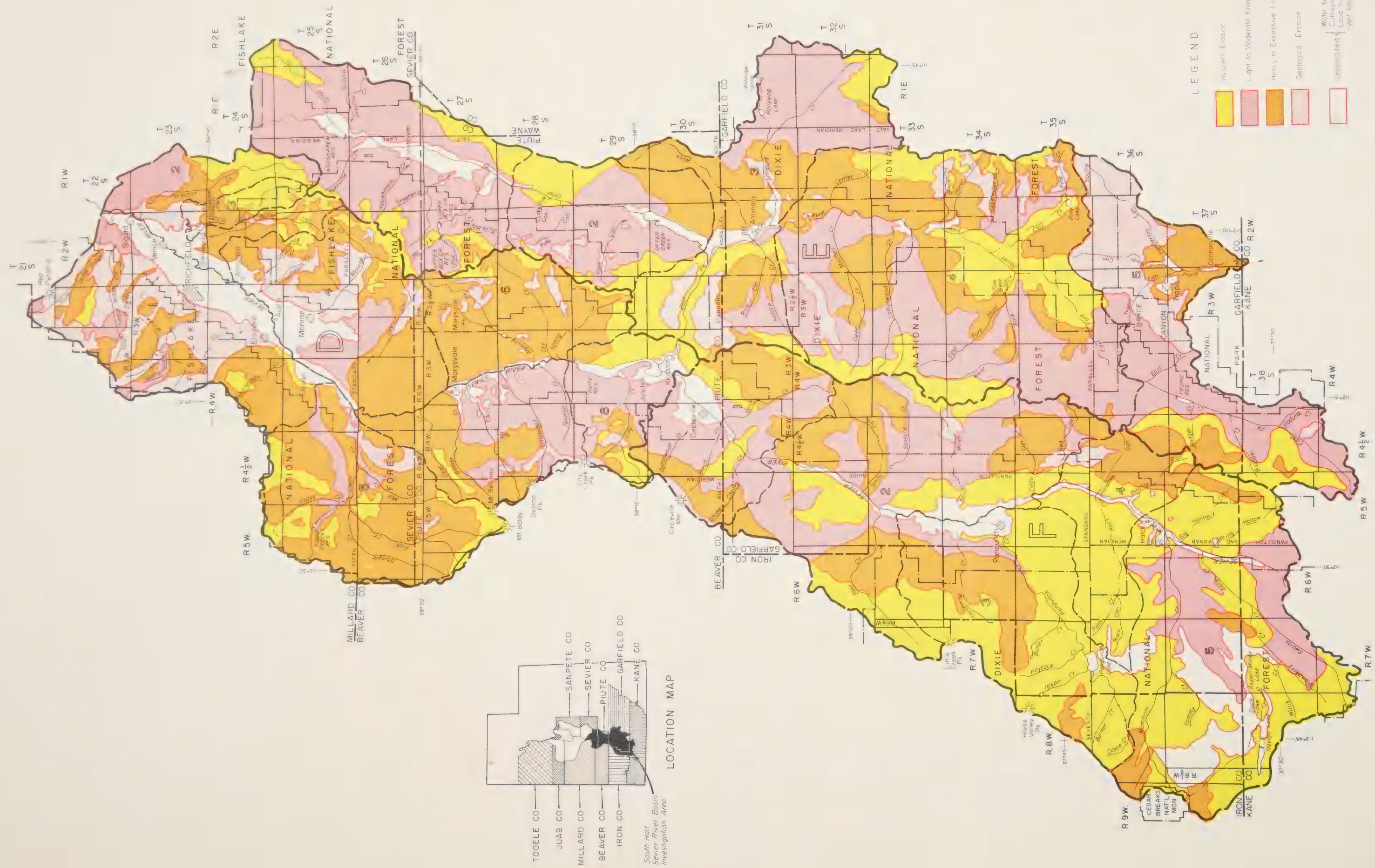
Light to moderate erosion: An active gully system beginning to form with cutting taking place in main channels and some secondary channels. Sheet erosion is light to medium. Some soil hummocks are present around plants. Erosion pavement is present and vegetation is patchy or of a predominantly tap-rooted species with less than 50 percent of the soil surface protected.

¹Main Report map number.

Table 1.--Erosion condition classification, Sevier River Basin

Watershed	Incipient		Light to moderate		Heavy to excessive		Geologic		Lava flows		Cultivated and water		Total
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	
A-1	86,305	41	50,520	24	21,050	10	--	--	--	--	52,625	25	210,500
A-2	44,376	43	23,736	23	5,160	5	3,096	3	--	--	26,832	26	103,200
A-3	25,413	43	13,002	22	13,002	22	1,773	3	--	--	5,910	10	59,100
A-4	24,321	33	12,529	17	13,266	18	2,211	3	--	--	21,373	29	73,700
Sub-basin A total	180,415	41	99,787	22	52,478	12	7,080	2	--	--	106,740	23	446,500
B-1	3,192	7	19,152	42	15,960	35	--	--	--	--	7,296	16	45,600
B-2	43,740	45	22,356	23	17,496	18	972	1	--	--	12,636	13	97,200
B-3	106,036	49	71,412	33	12,984	6	21,640	10	--	--	4,328	2	216,400
B-4	47,334	46	6,174	6	9,261	9	28,812	28	--	--	11,319	11	102,900
B-5	113,454	54	6,303	3	44,121	21	27,313	13	--	--	18,909	9	210,100
B-6	85,000	40	12,750	6	42,500	20	34,000	16	--	--	23,375	11	212,500
B-7	656,180	70	18,748	2	--	--	18,748	2	--	--	224,976	24	937,400
Sub-basin B total	1,054,936	58	156,895	9	142,322	8	131,485	7	--	--	302,839	16	1,822,100
C-1	52,920	45	22,344	19	18,816	16	10,584	9	--	--	12,936	11	117,600
C-2	3,987	3	70,437	53	19,935	15	10,632	8	--	--	27,909	21	132,900
C-3	83,875	61	11,000	8	19,250	14	1,375	1	--	--	22,000	16	137,500
C-4	18,614	41	7,718	17	6,810	15	--	--	--	--	12,258	27	45,400
C-5	125,370	63	1,990	1	53,730	27	13,930	7	--	--	3,980	2	199,000
C-6	37,791	51	7,410	10	26,676	36	--	--	--	--	2,223	3	74,100
Sub-basin C total	322,557	46	120,899	17	145,217	21	36,521	5	--	--	81,306	11	706,500
D-1	17,628	13	9,492	7	33,900	25	46,104	34	--	--	28,476	21	135,600
D-2	17,023	29	4,109	7	28,176	48	1,761	3	--	--	7,631	13	58,700
D-3	8,607	57	--	--	5,738	38	--	--	--	--	755	5	15,100
D-4	6,852	6	15,988	14	47,964	42	25,124	22	--	--	18,272	16	114,200
D-5	22,960	20	13,776	12	68,880	60	8,036	7	--	--	1,148	1	114,800
D-6	9,132	12	--	--	55,553	73	9,132	12	--	--	2,283	3	76,100
D-7	4,020	5	41,004	51	24,120	30	4,020	5	--	--	7,236	9	80,400
D-8	5,423	11	27,115	55	11,339	23	--	--	--	--	5,423	11	49,300
Sub-basin D total	91,645	14	111,484	17	275,670	43	94,177	15	--	--	71,224	11	644,200
E-1	33,308	22	101,438	67	1,514	1	--	--	--	--	15,140	10	151,400
E-2	17,720	20	33,668	38	36,326	41	--	--	--	--	886	1	88,600
E-3	37,306	23	72,990	45	45,416	28	--	--	--	--	6,488	4	162,200
E-4	71,714	23	137,192	44	99,776	32	--	--	--	--	3,118	1	311,800
E-5	20,398	14	45,167	31	65,565	45	11,656	8	--	--	2,914	2	145,700
Sub-basin E total	180,446	21	390,455	45	248,597	30	11,656	1	--	--	28,546	3	859,700
F-1	12,077	13	37,160	40	33,444	36	1,858	2	--	--	8,361	9	92,900
F-2	58,688	28	75,456	36	64,976	31	--	--	--	--	10,480	5	209,600
F-3	75,330	54	25,110	18	22,320	16	--	--	--	--	5,580	4	139,500
F-4	41,595	59	1,410	2	25,380	36	--	--	--	--	2,115	3	70,500
F-5	125,100	60	45,870	22	12,510	6	--	--	--	--	22,935	11	208,500
Sub-basin F total	312,790	43	185,006	26	158,630	22	1,858	--	--	--	28,621	5	721,000
Basin total	2,142,789	41	1,064,526	21	1,022,914	20	282,777	5	--	--	619,276	12	5,200,000





MAP 13

EROSION CONDITION

SOUTH HALF

SEVIER RIVER BASIN

UTAH

FEBRUARY 1969



Heavy to excessive erosion: Gully systems are well developed with active small gullies evident after heavy rains. Sheet erosion and hummocking is extreme, root systems of shrubs and trees may be exposed. In extreme cases, topsoil is eroded and gullies are cutting into subsoil. Plant cover, often annuals, is low in the successional stages and in extreme cases, is so limited it has no stabilizing influence on the soil. There is little or no litter present.

Geologic erosion: Scattered plants usually exist but large areas of bare soil are exposed. Soils often lack a distinctive "A" horizon. Erosion is a result of climatological and geological factors.

CRITICAL AREAS

Critical areas on National Forest and other forested lands were determined from a hydrologic condition survey to help identify areas for possible remedial measures. These areas are the principal sources of sediment. These lands were mapped into categories expressing quantitative information regarding on-site sediment production (Tables 2 and 3).

There is a close correlation between the hydrologic mapping and the erosion condition survey. Hydrologic Condition Class I and incipient erosion delineated similar areas as did Class II and light to moderate erosion, Class III, IV and heavy to excessive erosion, and Class V and geologic erosion. Because of this close correlation, the erosion condition map should adequately express hydrologic conditions as well as erosion rates within the accuracy of the original field work. Critical areas were based on lands in Hydrologic Condition Classes III, IV and V.

The values shown in Table 3 indicate the gross, on-site erosion and do not indicate the location or rate of sediment deposition. As shown in the table, Sub-basins C and D have the highest gross erosion rate on National Forest lands and Sub-basin F the lowest at 1.6 and 0.8 acre-feet per square mile annually, respectively.

Critical areas on private and Public Domain lands were determined by limited field surveys and previously mapped erosion conditions. Critical areas by watershed are shown in Table 4. On-site erosion by sub-basin and land ownership and administration is shown in Table 5. For purposes of the study, sediment yield was determined as 20 percent of the on-site erosion. This was based on work in the Beaver River Basin using stream relief length ratios, drainage density factors, and water yield information.

Table 2.--Hydrologic condition based on runoff and erosion on National Forest and other forested lands, Sevier River Basin, 1968

Condition class	Sub-basin						Total
	A	B	C	D	E	F	
I-Low accelerated runoff & sediment contribution. Average erosion less than .005 in./yr.	<u>Acres</u> 52,870	<u>Acres</u> 80,750	<u>Acres</u> 86,880	<u>Acres</u> 93,620	<u>Acres</u> 203,430	<u>Acres</u> 218,820	<u>Acres</u> 736,370
II-Moderate accelerated runoff and sediment contribution. Average erosion .005 to .040 in./yr.	21,990	35,140	40,770	56,540	135,070	83,200	372,710
III-High accelerated runoff and moderate sediment contribution. Average erosion .005 to .040 in./yr.	25,930	31,420	52,270	61,090	81,360	52,930	305,000
IV-High accelerated runoff and high sediment contribution. Average erosion greater than .040 in./yr.	26,360	59,600	81,200	87,500	67,960	47,980	370,600
V-High normal or geological runoff and high sediment contribution. Average erosion greater than .040 in./yr.	590	2,570	28,220	46,190	12,450	1,700	91,720
Total	127,740	209,480	289,340	344,940	500,270	404,630	1,876,400

Average erosion rates: A composite of findings at the Great Basin Experiment Station, Ephraim, Utah; the Sheep Creek water evaluation study conducted in Salina Canyon by the Forest Service on the Fishlake National Forest; the Chalk Creek Hydrologic Analysis also on the Fishlake National Forest; reservoir and debris basin surveys by the Soil Conservation Service.

Source: National Forest field surveys.

Table 3.--Annual gross sediment production based on hydrologic condition of National Forest and other forested lands, Sevier River Basin, 1968

Condition class	Erosion rate	Sub-basin						Total
		A	B	C	D	E	F	
	<u>Inches/year</u>	<u>Acre-feet</u>	<u>Acre-feet</u>	<u>Acre-feet</u>	<u>Acre-feet</u>	<u>Acre-feet</u>	<u>Acre-feet</u>	<u>Acre-feet</u>
I	.003	13	20	22	23	51	55	184
II	.020	37	59	68	94	225	139	622
III	.020	43	52	87	102	136	88	508
IV	.060	132	298	406	437	340	240	1,853
V	.060	3	13	141	231	62	8	458
Total		228	442	724	887	814	530	3,625

Average annual gross sediment production from area evaluated

Ac. ft./sq. mi. annually	1.1	1.3	1.6	1.6	1.0	0.8	1.2
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Table 4.--Critical areas by watershed, Sevier River Basin

<u>Watershed</u>	<u>Area (Acres)</u>	<u>Watershed</u>	<u>Area (Acres)</u>
A-1	26,800	D-1	35,370
A-2	6,700	D-2	29,480
A-3	16,700	D-3	5,900
A-4	<u>16,700</u>	D-4	53,060
Sub-basin A total	66,900	D-5	73,690
		D-6	58,960
B-1	13,690	D-7	26,530
B-2	14,930	D-8	<u>11,790</u>
B-3	11,200	Sub-basin D total	294,780
B-4	8,710		
B-5	38,570	E-1	12,790
B-6	37,330	E-2	29,850
B-7	<u>None</u>	E-3	36,250
Sub-basin B total	124,430	E-4	81,020
		E-5	<u>53,300</u>
C-1	35,360	Sub-basin E total	213,210
C-2	38,080		
C-3	35,360	F-1	31,100
C-4	13,600	F-2	60,700
C-5	100,630	F-3	20,700
C-6	<u>48,960</u>	F-4	23,700
Sub-basin C total	271,990	F-5	<u>11,800</u>
		Sub-basin F total	148,000

BASIN TOTAL - 1,119,310

Table 5.--On-site erosion rates and sediment yield from critical areas by sub-basin and ownership, Sevier River Basin

Sub-basin	National Forest	Public Domain	Private Lands	Total
	<u>Acre-feet</u>	<u>Acre-feet</u>	<u>Acre-feet</u>	<u>Acre-feet</u>
<u>Sub-basin A</u>				
On-site erosion	212	-	56	268
Sediment yield	42	-	11	53
<u>Sub-basin B</u>				
On-site erosion	409	109	26	544
Sediment yield	82	22	5	109
<u>Sub-basin C</u>				
On-site erosion	561	347	36	944
Sediment yield	112	69	7	188
<u>Sub-basin D</u>				
On-site erosion	633	325	-	958
Sediment yield	127	65	-	192
<u>Sub-basin E</u>				
On-site erosion	701	199	24	924
Sediment yield	140	40	5	185
<u>Sub-basin F</u>				
On-site erosion	467	137	70	674
Sediment yield	93	27	14	134
Total on-site erosion	2,983	1,117	212	4,312
Total sediment yield	596	223	42	861

STREAM CHANNEL CONDITIONS

Stream channel conditions on National Forests were evaluated according to channel stabilities of good, fair or poor (Table 6). The following descriptions explain the evaluation criteria:

Good: Stream channels with predominantly stable banks. Cutting may occur at bends or where the water is directed toward the bank. Protective vegetation grows on the streambanks and bottom.

Fair: Actively eroding channels with many areas lacking streambank vegetation. Heavy sediments are found in the flatter gradients. Stream bottom vegetation occurs as small patches on larger rocks.

Poor: Actively cutting channels where protective streambank and bottom vegetation is largely lacking.

SEDIMENTATION

Sedimentation is beneficial as a natural geologic process but increasingly damaging when accelerated. As the natural process is disturbed, there is a need for control. The data presented in this section reflect the results of several studies of varying intensities.

SEDIMENT YIELD STUDIES OF SELECTED DRAINAGES

Studies have evaluated sediment yield within several small drainages in and near the Sevier River Basin during past years. These studies have been re-evaluated and additional information added to give a more complete picture of sediment yield and its relationship to watershed characteristics.

Available data included measurements of reservoir, debris basin and alluvial fan deposits at a total of 24 sites. The information on geology, water yield and topography was obtained from existing reports and maps. Vegetative cover and condition were determined from a reconnaissance of the watersheds and from a knowledge of the area.

Water yields in acre-feet per square mile and sediment yields in tons per acre-foot of water were plotted on logarithmic paper. These points fall into two major groups based on elevation, vegetative cover and rock type. The scatter of the data did not lend itself to plotting a single curve so they were enclosed in enveloping lines. This data is shown in Table 7 and Figure 1.

Table 6.--Perennial stream channel conditions on National Forests,
Sevier River Basin, 1966

Watershed	Condition			Total
	Good	Fair	Poor	
	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>
A-1	12	49	45	106
A-2	9	18	20	47
A-3	--	44	24	68
A-4	--	24	10	34
Sub-basin A total	21	135	99	255
B-1 & B-2	--	14	16	30
Oak Creek Division	--	56	27	83
Fillmore Division	--	24	20	44
Sub-basin B total	--	94	63	157
C-2	--	13	23	36
C-3	--	36	57	93
C-4	--	5	8	13
C-5	--	69	17	86
C-6	4	24	6	34
Sub-basin C total	4	147	111	262
D-1	--	42	53	95
D-2, D-3, D-4	4	12	5	21
D-5	3	32	28	103
D-6	--	29	16	45
D-7	1	105	2	108
D-8	--	34	23	57
Sub-basin D total	8	254	127	389
E-1	12	64	1	77
E-2	1	31	9	41
E-3	--	62	--	62
E-4	7	20	181	208
E-5	21	25	7	53
Sub-basin E total	41	202	198	441
F-1	1	36	69	106
F-2	3	33	72	108
F-3	8	22	59	89
F-4	--	2	31	33
F-5	47	18	29	94
Sub-basin F total	59	111	260	430
Basin total	133	943	858	1,934
Percent	7	49	44	

Table 7.--Sedimentation data summary from selected drainages, Sevier River Basin

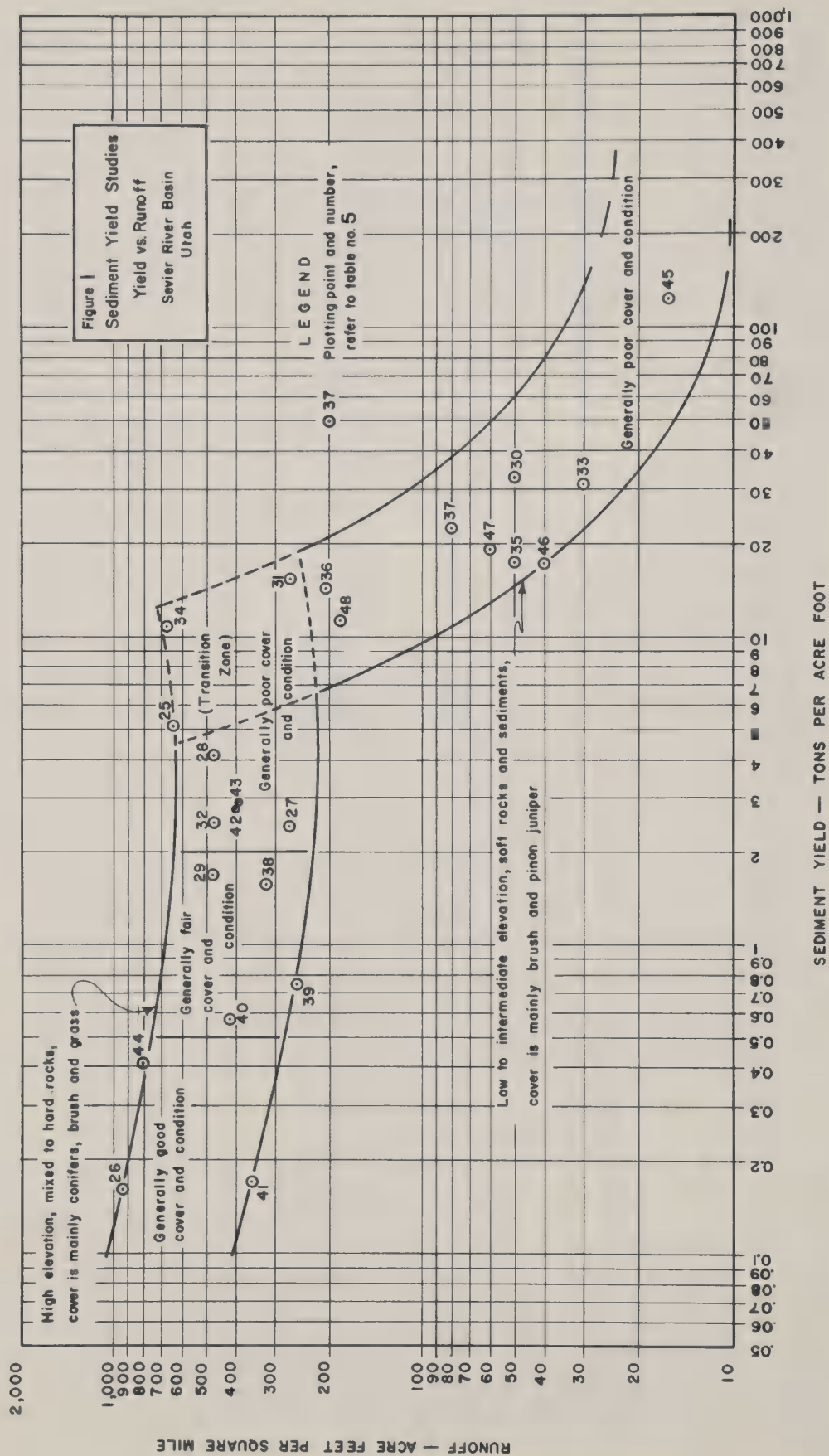
Reservoir or debris basin and drainage	Plotting number	Aspect	Drainage		General geology	Topography			Water yield - annual			Vegetative cover and condition		Sediment rate annual		
			Area acres & (sq. mi.)	Length (feet)		Rock type	Relief difference	Relief ratio	Slope area ratio	Inches	Ac. ft.	Ac. ft. per sq. mi.	Pinyon-juniper and brush	High elev. conifers and deciduous grass	Tons per ac. ft. of water	Ac. ft. per sq. mi.
Tertiary Volcanics																
Sand & "H" Canyon, Monroe	37	W	1,500 (2.34)	10,500	Latite, breccia, tuff	5,300 7,900	0.248	1.733	1.5	190	80	100% Poor	--	22.44 ^a	1.10	
Magleby Reservoir, Monroe Creek	38	SW	1,890 (2.95)	13,500	Andesite	9,300 10,800	0.111	0.794	6.0	950	320	--	100% Fair	1.58 ^a	0.31	
Box Creek Reservoir, Box Creek	49	SE	6,980 (10.91)	26,000	Andesite	8,800 10,250	0.056	0.208	3.8	2,210	205	--	100% Fair	0.74 ^b	0.10	
Booby Hole Reservoir, Booby Creek	39	W	2,590 (4.05)	18,500	Andesite	7,200 10,600	0.184	1.313	4.8	1,030	255	35% Fair	65% Fair	0.74 ^a	0.115	
Seven Mile Reservoir, Lost Creek	40	NE	1,200 (1.88)	7,900	Andesite	9,800 10,600	0.101	0.667	7.7	770	410	--	100% Fair	0.57 ^a	0.145	
Indian Creek Reservoir, Indian Creek	41	W	2,000 (3.13)	11,500	Latite, breccia, tuff	8,000 11,250	0.283	1.625	6.7	1,110	355	--	100% Good	0.17 ^a	0.038	
Koosharem Reservoir, Daniels Creek	50		34,800 (54.38)	50,000	Andesite	7,200 11,600	0.084	0.121	3.6	10,540	195	50% Poor	50% Fair	1.57 ^b	0.20	
Yankee Reservoir, Yankee (Pole) Creek	42	NW	1,690 (2.64)	10,200	Ash, basalt, andesite	8,500 10,500	0.196	1.183	7.6	1,070	405	--	100% Fair	2.79 ^b	0.74	
Mainly Tertiary Sediments																
Soldier Basin, Soldier Canyon	33	N	8,070 (12.61)	29,600	Sh, ss, ls	5,700 7,400	0.057	0.211	0.6	370	30	100% Poor	--	31.04 ^a	0.57	
Bull Pasture Basin, Salina Creek	32	S	24,220 (37.84)	62,500	Sh, ss, ls, congl.	7,000 11,000	0.064	0.165	8.8	17,840	470	10% Poor	90% Poor	2.47 ^a	0.71	
Skutumpah Reservoir, Skutumpah	43	SW	5,680 (8.88)	21,000	Sh, ss, ls, congl.	7,900 10,900	0.143	0.528	7.4	3,490	395	20% Poor	80% Poor	2.89 ^a	0.70	
Ephraim Fan, Ephraim Creek	34	W	14,750 (23.05)	46,900	Sh, ss, ls	5,600 10,400	0.102	0.325	12.6	15,500	670	50% Poor	50% Poor	10.92 ^c	4.20	
Mt. Pleasant Fan, Pleasant Creek	25	W	10,560 (16.50)	27,900	Sh, ss, ls, congl.	6,700 10,400	0.133	0.350	12.1	10,630	645	25% Fair	75% Poor	5.13 ^c	1.90	
Boulder Pond, Boulder Canyon	26	NE	1,990 (3.11)	20,600	Sh, ss, ls	8,700 9,800	0.053	0.553	17.6	2,920	940	--	100% Good	0.16 ^b	0.10	
Duck Fork Reservoir, Duck Fork	44	NE	1,790 (2.80)	12,500	Sh, ss, ls	8,700 10,200	0.120	0.838	15.0	2,240	800	--	100% Good	0.41 ^a	0.20	
Cottonwood Fan, Richfield	36	SE	10,670 (16.67)	52,500	Sh, ss, ls	5,600 9,600	0.057	0.281	3.8	3,425	205	70% Poor	30% Poor	14.44 ^c	1.70	
Flat Canyon Fan, Elsinore	51	S & E	9,270 (14.48)	30,200	Andesite, tuff, sh, ss, ls	5,600 7,700	0.070	0.227	1.0	765	55	100% Poor	--	22.20 ^a	0.70	
Demark Wash, Salina	35	E	18,130 (28.33)	43,700	Sh, ss, ls, siltstone	5,500 9,000	0.080	0.193	1.0	1,460	50	95% Poor	5% Poor	17.32 ^a	0.53	

Table 7 continued

Reservoir or debris basin and drainage	Plotting number	Aspect	Drainage		General geology	Topography			Water yield - annual			Vegetative cover and condition		Sediment rate annual	
			Area acres & (sq. mi.)	Length (feet)		Rock type	Relief difference	Relief ratio	Slope area ratio	Inches	Ac. ft.	Ac. ft. per sq. mi.	Pinyon-juniper and brush		High elev. conifers and deciduous grass
Mainly Paleozoic to Cenozoic Rocks															
Frog Hollow	45	NW	5,888 (9.2)	26,400	Sh, ls, basalt	4,200	0.067	0.272	0.3	147	16	100% Poor	--	123.00 ^c	1.13
Debris Basin			11,200		Sh, siltstone,	5,000						80%	20%	17.40 ^c	0.40
Mill Canyon Retention Structure, Glenwood	46	N	(17.50)	34,200	andesite	9,200	0.123	0.375	0.7	690	40	Poor	Fair		
Fiddlers Canyon			5,380		Ash, basalt, sh,	5,500						60%	40%		
Debris Basin	47	NW	(8.41)	33,300	ls, ss, andesite	9,600	0.123	0.762	1.2	520	60	Poor	Poor	19.08 ^a	0.70
Green's Lake W.P.,			3,440		Sh, ss, ls,	5,200						85%	15%		
Cedar City	48	NW	(6.23)	18,300	basalt, congl.	9,400	0.230	1.053	3.5	1,165	185	Poor	Fair	11.30 ^c	1.20
Corn Creek Fan,			54,500		Qtz, sh, ss,	5,200						60%	40%		
Kanosh	27	S & W	(85.16)	81,500	ls, congl.	10,000	0.059	0.088	5.1	23,200	270	Poor	Fair	2.42 ^a	0.40
Meadow Basin,			9,000		Qtz, sh, ss,	5,300						50%	50%		
Meadow Creek	28	W	(14.06)	42,700	ls, congl.	10,300	0.117	0.556	8.9	6,710	480	Poor	Poor	4.08 ^a	1.20
Chalk Creek Basin,			37,200		Qtz, sh, ss,	5,200						40%	60%		
Fillmore	29	W	(58.13)	53,100	ls, congl.	10,300	0.096	0.137	9.0	27,960	480	Fair	Poor	1.69 ^a	0.50
Miller-Biglow W.P.,			3,290		Sh, ss, ls,	5,100						90%	10%		
Nephi	30	W	(5.14)	22,500	congl.	9,800	0.209	1.429	0.9	260	50	Poor	Poor	32.70 ^a	1.00
Coal Creek Fan,			54,900		Basalt, sh, ss,	5,600						35%	65%		
Cedar City	31	NW	(85.78)	71,200	ls, congl., ash	10,300	0.066	0.086	4.9	22,580	265	Poor	Poor	15.13 ^c	2.30

Qtz = quartzite, sh = shale, ss = sandstone, ls = limestone, congl. = conglomerate.

^aEst. using 75 lbs./ft.³^bEst. using 70 lbs./ft.³^cEst. using 80 lbs./ft.³



Sediment rates for other drainages nearby can be obtained by comparing the selected parameters with the sediment data from those watersheds evaluated. This is accomplished by entering the sediment chart with the computed water yield and choosing sediment rates from within the envelope which most nearly fit the balance of the watershed characteristics.

SEDIMENTATION IN MAJOR RESERVOIRS

Detailed topographic surveys were made of Otter Creek, Piute, and Sevier Bridge Reservoirs during 1961 and 1962. These were performed by establishing third order horizontal and vertical ground survey networks as a control for aerial photography made from low-level flights. From these, through Kelsh Plotter methods, topographic maps were prepared. These were compared to previous surveys to determine the amount of sediment deposition within the reservoir area. Table 8 shows the results of this analysis. Not included in the sediment volumes is that amount deposited above the maximum high water line.

WATER QUALITY SURVEY

A reconnaissance water quality survey was conducted by the U. S. Geological Survey during 1964 in cooperation with the State of Utah and with assistance by the U. S. Department of Agriculture. Data were collected during four 4-day periods to provide information for representative streamflow regimens throughout the year. Data obtained at selected sampling stations are shown in Tables 9 and 10. More detailed information is available in the following publications:

Hahl, D. C., and Cabell, R. E., "Quality of Surface Water in the Sevier Lake Basin, Utah," 1964, U. S. Geological Survey, Utah Basic-Data Release No. 10, 1965.

Hahl, D. C., and Mundorff, J. C., "An Appraisal of the Quality of Surface Water in the Sevier Lake Basin, Utah," 1964, U. S. Geological Survey and State of Utah Department of Natural Resources, Technical Publication No. 19, 1968.

Generally, the total concentration of dissolved solids is less than 500 ppm above the Richfield area. As the water moves downstream, concentrations increase rapidly as return flows and groundwater leach salts from bedrock, reaching a weighted average of 1,700 ppm at Sevier Bridge Reservoir. The same is true of the San Pitch River where the increase is from 300 ppm near Fairview to 1,700 ppm near Sterling. The sodium and salinity hazards increase from low to high in these reaches also.

Table 8.--Reservoir sedimentation, Sevier River

Item	Unit	Reservoir		
		Otter Creek	Piute	Sevier Bridge
Nearest town		Antimony	Junction	Scipio
County		Piute	Piute	Juab, Sanpete
Elevation top of pool	Ft. MSL	6,374.8	5,977.0	5,017.5
Surface acres (1960)	Acres	2,520	2,600	10,910
Capacity (1960)	Ac.-Ft.	52,660	71,830	236,150
Average annual water inflow	Ac.-Ft.	41,250	122,780	117,000
Total drainage area	Sq. Mi.	1,150	2,440	5,120
Sediment contributing area	Sq. Mi.	1,020	1,220	2,030
Years since previous survey	Years	37	22	28
Sedimentation:				
Total	Ac.-Ft.	2,140	2,730	3,340
Average annual	Ac.-Ft.	58	124	119
Average annual yield	Ac.-Ft./Sq.Mi.	0.057	0.102	0.059
Average annual deposition	Ac.-Ft./1,000 Water inflow	1.40	1.01	1.07
Storage capacity loss	Av. annual	0.110%	0.173%	0.051%

Table 9.--Chemical and bacteriologic analyses of surface water at selected stations, 1964, Sevier River Basin

Station	Discharge (cfs)	Dissolved solids		SAR ^a	MPN ^b
		Parts per million	Tons per day		
Sevier River near Circleville	69.0	271	50.0	0.8	-
	114.0	214	66.0	0.8	-
	74.0	343	69.0	3.3	-
	52.0	268	38.0	1.4	-
Sevier River near Kingston	104.0	304	85.0	0.6	200
	24.0	334	22.0	0.9	4,300
	e6.0	346	5.6	1.0	430
	10.0	413	11.0	1.1	430
East Fork Sevier River near Kingston	3.2	384	3.3	0.4	75
	44.0	322	38.0	0.5	750
	177.0	274	131.0	0.6	930
	31.0	328	27.0	0.6	430
Sevier River near Sevier	38.0	322	33.0	0.9	43
	359.0	280	271.0	0.8	230
	88.0	280	67.0	0.7	75
	40.0	306	33.0	0.9	9
Vermillion Canal at Glenwood Road	9.0	606	15.0	0.8	43,000
	11.0	764	23.0	1.2	930
	20.0	654	35.0	1.7	930
	5.0	915	12.0	1.6	2,300
Sevier River at Glenwood Road	64.0	430	74.0	0.8	93
	35.0	548	52.0	1.2	230
	4.9	950	13.0	1.4	750
	30.0	398	32.0	1.4	2,300
Lost Creek at mouth near Aurora	7.3	2,160	43.0	14.0	-
	e0.1	30,400	8.2	80.0	-
	e0.2	38,500	22.0	93.0	-
	1.2	28,500	92.0	73.0	-
Sevier River near Salina	e90.0	913	222.0	2.6	43
	52.0	1,120	157.0	3.3	1,500
	17.0	1,400	64.0	4.5	930
	21.0	2,950	167.0	11.0	2,300

Table 9 continued

Station	Discharge (cfs)	Dissolved solids		SAR ^a	MPN ^b
		Parts per million	Tons per day		
Salina Creek at Salina	22.0	640	38.0	2.8	28
	58.0	285	45.0	0.9	1,500
	0.4	4,990	5.4	16.0	4,300
	0.8	9,360	20.0	31.0	23,000
Sevier River near Gunnison	150.0	1,150	466.0	4.3	9,300
	212.0	947	542.0	3.9	930
	44.0	2,480	295.0	11.0	930
	78.0	2,120	466.0	7.7	2,300
San Pitch River at Fairview	4.4	350	4.2	0.5	-
	58.0	246	39.0	0.2	-
	4.6	406	5.0	0.4	-
	1.1	281	0.8	0.7	-
San Pitch River near Sterling	1.5	2,450	9.9	12.0	4,300
	53.0	1,070	153.0	2.9	430
	95.0	1,660	426.0	4.8	930
	49.0	1,680	222.0	5.3	210
Sevier River near Lynndyl	15.0	1,130	46.0	3.4	23
	1,020.0	1,540	4,240.0	6.7	430
	114.0	1,380	425.0	5.8	750
	97.0	1,510	395.0	6.2	430
Sevier River near Hinckley	3.8	2,790	29.0	5.9	23,000
	5.5	2,730	41.0	5.8	7,500
	6.7	2,430	44.0	6.5	230,000
	3.4	2,670	25.0	5.9	750

^aSodium-absorption-ratio.

^bMost probable number coliforms.

Notes: 1. The four readings at each station were made March 9-11, May 18-20, July 27-30 and September 21-23, 1964.

2. e = estimated.

Reference: Hahl, D. C., and Cabell, R. E., "Quality of Surface Water in the Sevier Lake Basin, Utah," U. S. Geological Survey Utah Basic-data Release No. 10, 1965.

Table 10.--Suspended sediment analyses of surface water at selected stations,
1964, Sevier River Basin

Station	Discharge	Sediment		
		Concentration	Discharge	
	<u>CFS</u>	<u>PPM</u>	<u>Tons per day</u>	<u>Acre-feet per day^a</u>
Sevier River at Hatch	44.0	150	18.0	0.011
	195.0	689	363.0	0.218
	61.0	343	56.0	0.034
	42.0	61	6.9	0.004
Sevier River near Circleville	69.0	1,120	209.0	0.125
	114.0	1,510	465.0	0.279
	74.0	51,100	10,600.0	6.360
	52.0	215	30.0	0.018
East Fork Sevier River near Antimony	16.0	42	1.8	0.001
	86.0	452	105.0	0.063
	18.0	62	3.0	0.002
	17.0	22	1.0	0.001
Sevier River near Sevier	38.0	31	3.2	0.002
	359.0	313	303.0	0.182
	80.0	47	11.0	0.007
	40.0	43	4.6	0.003
Lost Creek above diversion near Aurora		(no sample this date)		
	51.0	2,920	402.0	0.241
	17.0	41	1.9	0.001
	6.8	33	0.6	-
Lost Creek at mouth near Aurora	7.3	1,510	30.0	0.018
	e0.1	0	t	-
	e0.2	8	t	-
	1.2	251	0.8	-
Sevier River near Salina		(no sample this date)		
		(no sample this date)		
		(no sample this date)		
	21.0	735	42.0	0.025
Salina Creek above diversions near Salina	16.0	412	18.0	0.011
	178.0	2,840	1,360.0	0.816
	22.0	46	2.7	0.002
	16.0	79	3.4	0.002

Table 10 continued

Station	Discharge	Sediment		
		Concentration	Discharge	
	<u>CFS</u>	<u>PPM</u>	<u>Tons per day</u>	<u>Acre-feet per day^a</u>
Salina Creek at Salina	22.0	442	26.0	0.016
	58.0	4,040	633.0	0.380
	0.4	74	0.1	-
	0.8	87	0.2	-
Sevier River near Gunnison	150.0	678	275.0	0.165
	212.0	619	354.0	0.212
	44.0	68	8.1	0.005
	78.0	114	24.0	0.014
San Pitch River at Fairview	4.4	23	0.3	-
	58.0	149	23.0	0.014
	4.6	24	0.3	-
	1.1	24	0.1	-
Sevier River near Lynndyl	15.0	143	5.8	0.003
	1,020.0	833	2,290.0	1.374
	114.0	91	28.0	0.017
	97.0	80	21.0	0.013

^aBased on 75 pounds per cubic foot.

Notes: 1. The four readings at each station were made March 9-11, May 18-20, July 27-30 and September 21-23, 1964.

2. e = estimated.

3. t = less than 0.05.

Reference: Hahl, D. C., and Cabell, R. E., "Quality of Surface Water in the Sevier Lake Basin, Utah," U. S. Geological Survey Utah Basic-data Release No. 10, 1965.

The suspended sediment data do not accurately indicate the total load carried throughout the year. Any single event could carry more sediment than is carried during the balance of the year. In most cases, the samples probably indicate the suspended sediment loads for most of the year.

By comparing the sedimentation measured in the three major reservoirs (Table 8) with the sediment load carried by the main stem of the river system, a major difference is evident. The trap efficiency of the reservoirs should approach 100 percent and thus more accurately indicate the total sediment load at that point. On this assumption, the total annual load is 100 to 200 times that shown by the samples taken during 1964.

